This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

VM
155
.U5
1919

A 446953

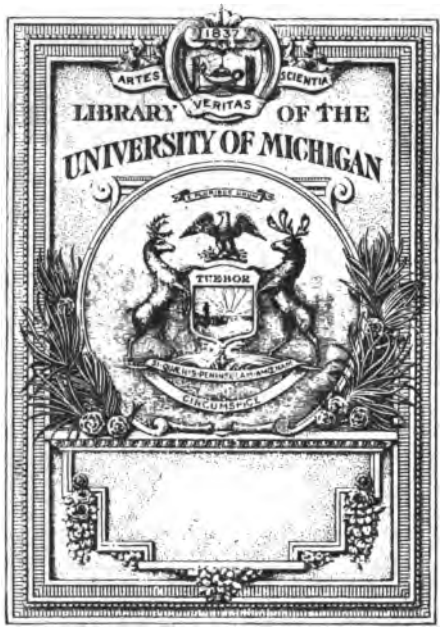
DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION

MEASUREMENT OF VESSELS

REGULATIONS INTERPRETING LAWS RELATING TO ADMEASUREMENT OF VESSELS, TOGETHER WITH THE LAWS OF UNITED STATES AND THE SUEZ CANAL REGULATIONS

THIRD EDITION, WITH DIAGRAMS
JANUARY 1, 1919

WASHINGTON
GOVERNMENT PRINTING OFFICE
1919



THE GIFT OF
Supt. of Documents

5-5-

VM
155
.U5
1919

DEPARTMENT OF COMMERCE

U.S. BUREAU OF NAVIGATION

MEASUREMENT OF VESSELS

REGULATIONS INTERPRETING LAWS RELATING TO ADMEASUREMENT OF VESSELS, TOGETHER WITH THE LAWS OF UNITED STATES AND THE SUEZ CANAL REGULATIONS

THIRD EDITION, WITH DIAGRAMS
JANUARY 3, 1919

WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

VM
155
.U.S.
1919

CONTENTS.

PART I.—INSTRUCTIONS FOR THE TONNAGE MEASUREMENT OF VESSELS.

	Page.
Preliminary	7
Gross tonnage	7
Principal dimensions	7
Tonnage deck	7
Register length	10
Breadth of beam	10
Depth of hold	11
Gross tonnage	11
Under-deck tonnage	11
Tonnage length	11
Breaks in double bottom	13
Transfer of sections to keelson	14
Round of beam	14
Transverse areas	15
Side water-ballast tanks	16
Extended double bottoms	17
Double bottoms	17
Double bottoms with cargo, stores, or fuel	18
Bulk-oil carriers	19
Cubical contents under tonnage deck	19
Special exempted water-ballast peaks, etc	20
Between decks	20
Hatchways	20
Deck houses and spaces on the upper deck	21
After breadths of poops on round-stern ships	21
Deck erections	22
Closed-in spaces which may be exempted	22
Shelter-deck spaces	23
Shelter for deck passengers	24
Special passenger accommodations	24
Deck to the hull	24
Record of excluded spaces	24
Motor boats	25
Open vessels	25
Net tonnage—Deductions from gross tonnage	25
General rule	25
Deductions	25
Crew spaces	25
Penalty for obstructing crew spaces	26
Marking of crew spaces	26
Dimensions and requirements of crew spaces	26
Hospital spaces	26
Wash rooms and bathrooms	27
Fumigation	27
Mississippi River steamboats	27
Master's cabin	27
Navigation spaces, etc	28
Donkey engine and boiler	28
Storage of sails	28
Propelling-power percentages	29
Spaces above crown of engine room	29
Measurement of engine room	31
Spaces included in engine room	31

Net tonnage—Deductions from gross tonnage—Continued.
Spaces included in engine room—Continued. Page.
Shaft trunks ... 32
Rule for measurement of engine space ... 32
Deductions from engine room ... 33
Special rule for dredgers ... 33
Net tonnage ... 33
Miscellaneous ... 33
Final results ... 33
Marking and recording of tonnage ... 33
Change of tonnage ... 34
New documents issue from readmeasurements ... 34
Appendix for foreign ports ... 35
Measurement of Government vessels ... 35
Foreign vessels ... 35
Measuring instruments ... 35
Blanks ... 37
Plans and drawings for measurers ... 37
Tables ... 38
Decimal equivalent of inches ... 38
Reduction of tons to cubic meters ... 38
Definition of inclosures above deck ... 38
Definition of items of deduction ... 39
Definition of structural terms ... 40
Résumé of exemptible spaces ... 42
Index ... 43

PART II.—LAWS OF THE UNITED STATES RELATING TO THE MEASUREMENT OF VESSELS.

Measurement ... 47
Gross tonnage ... 48
Deck houses, breaks, etc ... 50
Hatchways ... 50
Between decks ... 50
Open vessels ... 51
Water ballast ... 51
Net tonnage ... 51
Crew accommodations ... 52
Deductions for other purposes ... 53
Deductions for propelling power ... 54
Register tonnage ... 55
Appendix of measurement ... 56
Vessels exempt from measurement ... 56
Measurement of foreign vessels ... 56
Exemption from measurement ... 56
Index ... 58

PART III.—PANAMA CANAL MEASUREMENT.

Measurement of vessels and tonnage certificates at ports of United States ... 59
Copies of rules for measurement and tonnage certificates ... 59
Questions of interpretations ... 59

PART IV.—SUEZ CANAL MEASUREMENT.

Suez Canal measurement rules ... 61
General principles ... 61
Rule I.—For measuring the gross tonnage of empty vessels ... 61
Rule II.—For measuring gross tonnage of laden ships ... 64
Deductions ... 65
Sailing vessels ... 65
Steamships ... 65
Ships having coal bunkers with movable partitions ... 65
Ships with fixed coal bunkers ... 66
Additional deductions allowed by the Suez Canal Co ... 67
Measurement of deck spaces (supplementary rules of 1904) ... 68
Ships with only one tier of superstructures ... 68
Ships having more than one tier of superstructures ... 68
Remark ... 68

Memorandum by the Universal Maritime Canal Co. of Suez on the application of the rules of 1904 relative to the measurement of superstructures: Pages.
Definition of the various spaces above deck 69
Determination of the deck spaces to which the rules of 1904 apply 69
Nature of the exemptions permitted by the rules of 1904 70
Ships with one tier of superstructures 70
Isolated spaces 70
Combined spaces 71
Shelter deck 71
Ships with more than one tier of superstructures 71
Conditions for the application of exemptions provided for by the rules of 1904. 72
Explanatory sketches 72
Instructions to American customs officers 80
Preliminary 80
Gross tonnage 80
Spaces above deck 80
Open spaces 81
Exempted spaces 81
Light and air casings over engine and boilers 82
Marking of exempted spaces 82
Access 83
Penalty for cargo in exempted spaces 83
Net tonnage 83
Allowance for propelling power 83
Crew-space deductions 84
Navigation-space deductions 84
Marking of deducted spaces 85
General 85
Index 85

PART V.—MEASUREMENT OF UNITED STATES NAVAL VESSELS FOR THE SUEZ CANAL.

Instructions and regulations 87
General instructions 87
Gross tonnage 89
Instructions and definitions as to gross tonnage 94
Net tonnage 98
Instructions and definitions as to net tonnage 100
Method of procedure 105
Classification of items on certificate 106
Résumé 106
References 109
Index 109

DEPARTMENT OF COMMERCE,
BUREAU OF NAVIGATION,
Washington, January 3, 1919.

To collectors and surveyors of customs and others concerned:

This edition, which is published for your guidance and information, supersedes the editions issued in 1915. The contents have to a small extent been rearranged and rewritten, and the instructions, given by general letters and otherwise, on the various questions that have arisen since the previous editions, have been embodied herein.

E. T. CHAMBERLAIN,
Commissioner.

Approved:
E. F. SWEET,
Acting Secretary.

MEASUREMENT OF VESSELS.

Part I.—INSTRUCTIONS FOR THE TONNAGE MEASUREMENT OF VESSELS.

PRELIMINARY.

ARTICLE 1. (*a*) Before any vessel shall be registered, enrolled, or licensed she shall be measured by an officer of the customs[1] at the place where she may be.

(*b*) A vessel is not to be measured unless she is required by law to be registered, enrolled, or licensed, or otherwise specially provided for.

(*c*) The Commissioner of Navigation is charged with the supervision of the laws relating to the admeasurement of vessels, and on all questions of interpretation growing out of the execution of the laws relating to this subject his decision is final. (Act of July 5, 1884.)

GROSS TONNAGE.

PRINCIPAL DIMENSIONS.

ART. 2. (*a*) The marine document of every vessel shall show the date and place of build; the register length, breadth, depth, and, in vessels of more than two decks, the height under the third or spar deck; the number of decks and masts; build as to her head and stern; capacity under the tonnage deck, that of the between decks, and also, separately, permanently inclosed spaces on the upper deck to the hull, available for cargo or stores or for the berthing or accommodation of passengers or crew, and the omitted spaces on, above, or below the upper deck; gross tonnage; items of deduction; and net tonnage.

(*b*) All measurements are to be taken in feet and fractions of feet, and all fractions of feet shall be expressed in decimals.

TONNAGE DECK.

ART. 3. (*a*) The tonnage deck in vessels having three or more decks to the hull shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage deck. (Fig. 1.)

(*b*) If the second deck from the keel consists of several partial decks extending with breaks from stem to stern, the line of that course of decks must be taken as the tonnage deck; and if the partial decks are at different heights, the line of the lowest will be taken as the tonnage deck, and the headroom above such line under the higher will be measured.

[1] Until Sept. 1, 1919, the provisions of law requiring measurement, by officers of the United States, of foreign-built ships admitted to United States registry under act of Aug. 18, 1914, will be suspended. (Executive order of Sept. 7, 1917.)

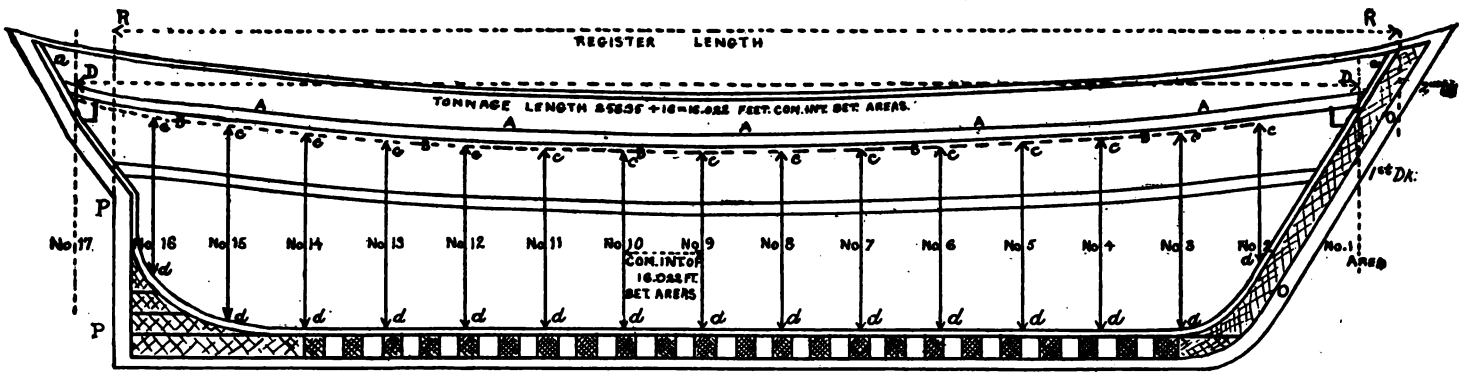


FIG. 1.—Showing the register and tonnage lengths of a two-deck vessel of the sixth class, the points of division of her tonnage deck for the stations of the transverse sections, the areas of which are required to be found, and the depth of each such transverse section. (The diagram, being merely descriptive, is not drawn to scale.)

O O represents the line of the forward ends of the outer planking on the side of the stem.

P P represents the after part of the rudder post or sternpost.

R R represents the register length.

a a represent the inside of the inner plank or ceiling on the side of the stem and on the stern timbers.

A A A, etc., represents the upper side of the tonnage deck.

B B B, etc., represents the under side of the tonnage deck or the line of the top of the deck beams on which the deck is laid.

D D represents the tonnage length taken on the upper side of the deck from the inside of the inner plank or ceiling on the side of the stem and on the stern timbers, showing the deduction at each end (viz, the distance from the inside of the inner plank at the side of the stem and on the stern timbers to the upright dotted lines at D), as prescribed by the rule, on account of the rakes of the bow and stern. These deductions are necessary in consequence of the length being taken above its right position; the right position being at the head or top of the areas, shown by the dotted lines passing through the points *c, c, c*, etc., at one-third of the round of the beam below the deck line.

The tonnage length being in this case 256.35 feet, is divided into 16 equal parts, giving the stations of the areas with a common interval of 16.022 feet.

c d, c d, etc., represent the stations and depths of the areas of the transverse sections at the 15 points of division of the tonnage deck.

c, c, c, etc., show the upper points of the depths at one-third of the round of the beam below the deck or line of the top of the deck beams.

d, d, d, etc., show the lower points of the depths at the upper side of the ceiling at the inside of the limber strake and alongside the keelson, laid on the floor beams or frames at the bottom of the vessel.

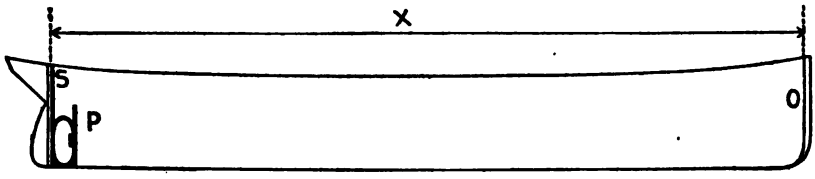


FIG. 2.—Register length of screw steamers with ordinary stern frame.

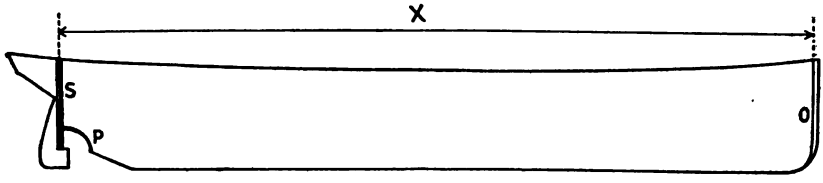


FIG. 3.—Register length of screw steamers with new-type stern frame.

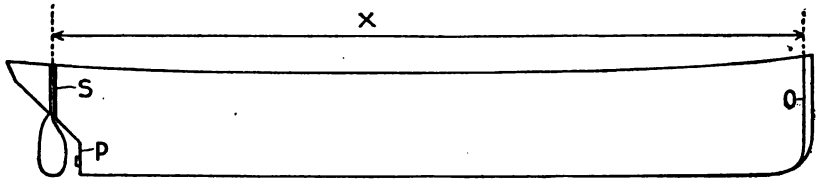


FIG. 4.—Register length of type of screw steamers on the Lakes.

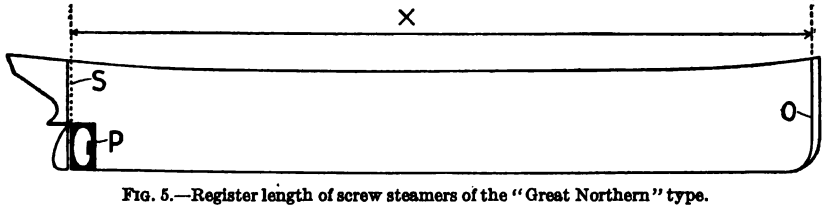


FIG. 5.—Register length of screw steamers of the "Great Northern" type.

In figs. 2, 3, 4, and 5, X represents register length; O, line of forward ends of outer planking on side of stem; P, propeller post; and S, after part of stern frame or main sternpost.

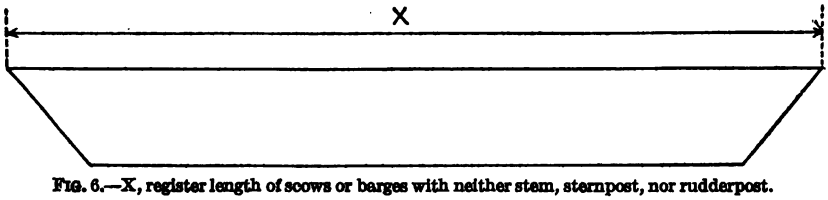


FIG. 6.—X, register length of scows or barges with neither stem, sternpost, nor rudderpost.

REGISTER LENGTH.

ART. 4. (*a*) The length from the fore part of the outer planking on the side of the stem to the after part of the main sternpost of screw steamers—i. e., the one to which the rudder is attached—and to the after part of the rudderpost of all other vessels measured on the top of the tonnage deck shall be accounted the vessel's length. (Figs. 1–5.)

(*b*) The register length of scows and barges with a square bow and stern sloping up from the bottom to the deck and with neither stem, sternpost, nor rudderpost is to be taken on the deck from the

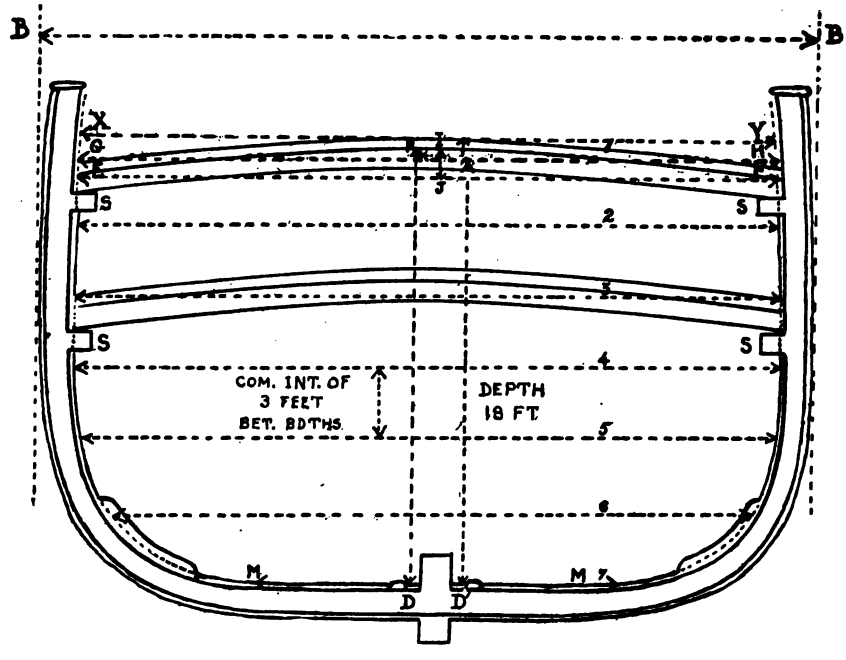


FIG. 7.—Register breadth, register and tonnage depths, round and one-third round of beam, and breadths of a midship section of a vessel fitted with a ceiling and whose depth of hold exceeds 16 feet.
B B represents the register breadth.
I J represents the round of beam, the distance from the crown of the under side of the deck to the line E F drawn from the top of the deck beam at one side to the same point on the other side.
I K represents one-third of the round of beam.
R D represents register depth.
T D represents the tonnage depth.
1–7 represent the breadths of the section between the ceiling (average thickness) on the frames at the sides, taken at the common interval of 3 feet apart, the tonnage depth of 18 feet being divided by 6.
G H represents the upper breadth passing through the point K, the point of one-third round of beam.
M M represents the lower or seventh breadth, passing through the points D D′ at the inside of the limber strakes and extending as far as the apparent flat of the ceiling on the floors.

extreme point of the hull at the bow to the extreme point of the hull at the stern—i. e., the overall length of the hull is to be considered the register length of such vessels. (Fig. 6.)

BREADTH OF BEAM.

ART. 5. The breadth of the broadest part on the outside of the vessel shall be accounted the vessel's breadth of beam, and is to be taken by means of plumb lines let fall so as to touch the sides of the vessel or by other practical means. (Fig. 7.)

DEPTH OF HOLD.

ART. 6. (*a*) The register depth is to be taken from the under side of the tonnage-deck plank, midship, to the ceiling in the hold, average thickness, at the side of the keelson, in a direction perpendicular to the keel, which may be done by means of a square placed upon the upper side of the keelson. (Fig. 7.)

(*b*) If the vessel has a third deck, then the height from the top of the tonnage-deck plank to the under side of the upper-deck plank shall be accounted as the height under the spar deck.

GROSS TONNAGE.

ART. 7. (*a*) The tonnage measurements are taken for the purpose of ascertaining the internal capacity of measured spaces of vessels in tons of 100 cubic feet each, which measurers should proceed to find as soon as the vessel is sufficiently advanced in construction as to permit its being done, usually when the decks are laid or deck beams placed in position and the hold sufficiently cleared of material, etc.

(*b*) In case of steam vessels, the hold should be measured before the boilers and machinery are installed and the tanks filled with water.

(*c*) The gross tonnage of a vessel shall consist of the sum of the following items: (1) The cubical capacity below the tonnage deck;

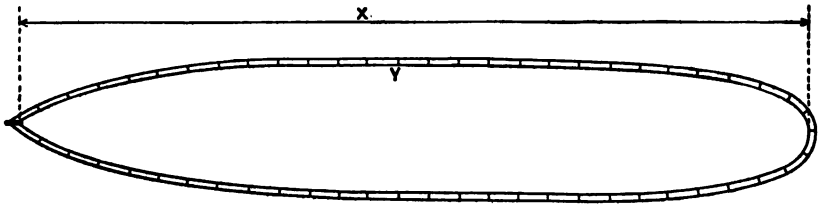


FIG. 8.—Tonnage length of uncelled vessels. X represents tonnage length: Y represents line of interior faces of frames.

(2) the cubical capacity of each space between decks above the tonnage deck; (3) the cubical capacity of the permanent closed-in spaces on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew; (4) the "excess of hatchways"; and (5) all permanent closed-in spaces situated elsewhere available for cargo or stores, or for the accommodation of the crew, or for the charts and navigating instruments (except cabins or staterooms for passengers constructed entirely above the first deck which is not a deck to the hull [R. S. 4151]).

UNDER-DECK TONNAGE.

The cubical capacity below the tonnage deck is to be ascertained as follows:

TONNAGE LENGTH.

ART. 8. (*a*) Measure the length of the vessel of usual sheer on the upper side of the tonnage deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern timbers or frames (average thickness, or inside of angle

irons or frames in iron ships not ceiled, fig. 8), deducting from this length what is due to the rake of the bow in the thickness of the deck and what is due to the rake of the stern timber or frame in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam.

(*b*) It may, however, sometimes be impracticable to ascertain either of the terminal points of the tonnage length on the upper side of the deck. In such cases the same result may be more conveniently reached by taking the length below the tonnage deck, from the inner planking under the deck hook, at the side of the stem to the inner planking on the stern timbers or frames; adding the rake of the bow in the thickness of the deck hook and the rake of the stern in the thickness of the deck timber or beam less one-third round of beam thereat. (Figs. 9 and 10.)

In the case of iron or steel vessels with the deck plating of the tonnage deck uncovered, the rakes of the bow and stern timber, etc., in the thickness of such plating are negligible and may be disregarded altogether. But in the case of wooden vessels with thick decks, it is important that such rakes be determined, which may be done as follows:

Place the hinged rule [1] referred to in art. 55 (*c*) so that the outer edge of one leg will rest on the upper surface of the tonnage deck, and the outer edge of the other leg on the inner face of the stem or stem lining or parallel thereto, finding the angle of inclination of the stem to the deck; then lay off with chalk, or other material that will make a visible mark, this angle on the deck or some smooth surface, and above the deck line of the angle, so laid off, at a distance equal to the thickness of the deck, draw a line parallel to said deck line, extending it to the stem line of the angle; then draw a perpendicular from the vertex of the angle to the said parallel line, and measure the distance from the foot of the said perpendicular therein to the stem line of the angle. The distance so found represents the rake of the stem in the thickness of the deck. (Fig. 9.) Similarly, the rake of the stern timber in the thickness of the deck of a ship with a stern ranging from a sharp to an elliptical stern may be found, one-third of round of beam in such cases being negligible. In a ship with a broader stern, the parallel line described above will be drawn at a distance equal to the sum of the thickness of the deck and one-third of round of beam at the stern; but otherwise the procedure will be the same as outlined above, and the rake so found will be the rake of the stern timber in the sum of the thickness of the deck and one-third of round of beam at the stern. (Fig. 10.)

The rakes of the stem and stern timber, in the thickness of the deck hook and aftermost deck beam or timber, respectively, are found in the same way, which rakes are required to be found only when the tonnage length is taken under deck, instead of on it, owing to obstructions or erections thereon at the time of measurement. The parallel line drawn for finding the length of such rake of the stem is to be at a distance equal to the depth of the deck hook, under which the length has been taken; in broad-stern vessels such rake of the stern timber is found by drawing the parallel line at a distance equal to the thickness of the aftermost deck beam or timber less one-third of round of beam at the stern.

[1] Instead of the hinged rule any other instrument for finding angles under similar circumstances may be used.

Method (*a*) will be used in all cases wherever possible, so it is desired that such vessels be admeasured before they are too far advanced to take their tonnage lengths on deck because of the adjustment of bowsprits or erections constructed thereon, especially in the case of wooden vessels propelled wholly or partly by sails.

(*c*) Divide the length so taken into the number of equal parts required by the following definition of classes, according to the class to which the vessel belongs (R. S. 4153), marking with chalk or otherwise the points so fixed and numbering them consecutively from bow to stern, No. 1 being at the extreme point of the length at the bow.

Class 1. Vessels of which the tonnage length according to the above measurement is 50 feet or under: Divide into 6 equal parts.

Class 2. Vessels of which the tonnage length according to the above measurement is above 50 feet, and not exceeding 100 feet long: Divide into 8 equal parts.

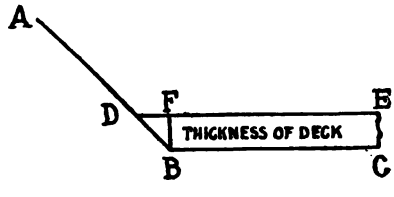


FIG. 9.—Showing the rake of the stem in the thickness of the deck.

Angle A B C represents the angle of inclination of the stem and deck lines as determined by the hinged rule; D E represents the line drawn parallel to and at a distance from the deck line equal to the thickness of the deck; B F represents the perpendicular from the vertex of the angle A B C to the parallel line D E; and D F represents the amount of the rake of the stem in the thickness of the deck.

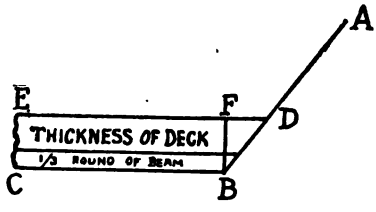


FIG. 10.—Showing the rake of the stern timber, in the thickness of the deck and one-third round of beam.

Angle A B C represents the angle of inclination of the line of one-third round of beam and the line of the stern timber D E represents the line drawn parallel to and at a distance from the line of one-third round of beam equal to the thickness of the deck and one-third round of beam; B F represents the perpendicular from the vertex of the angle A B C to the parallel line D E; and D F represents the amount of the rake of the stern timber in the thickness of the deck and one-third of round of beam.

Class 3. Vessels of which the tonnage length according to the above measurement is above 100 feet, and not exceeding 150 feet, long: Divide into 10 equal parts.

Class 4. Vessels of which the tonnage length according to the above measurement is above 150 feet, and not exceeding 200 feet, long: Divide into 12 equal parts.

Class 5. Vessels of which the tonnage length according to the above measurement is above 200 feet, and not exceeding 250 feet, long: Divide into 14 equal parts.

Class 6. Vessels of which the tonnage length according to the above measurement is above 250 feet: Divide into 16 equal parts.

BREAKS IN DOUBLE BOTTOM.

(*d*) The tonnage length of a vessel having a break or breaks in the line of her double bottom is to be divided into longitudinal sections (one more than the number of breaks) by erecting transverse vertical planes at such breaks. The length of each such section so found is then to be divided into a number of equal parts according to the class in the above table to which it belongs, just as if it were the length of a separate ship: *Provided*, That such sections as are 20 feet or under

in length may be divided into two equal parts; and those above 20 feet and not exceeding 40 feet in length may be divided into four equal parts instead of into six, as indicated in the table.

(*e*) The tonnage depth of the middle of the tonnage length will determine the number of parts into which all the remaining tonnage depths are to be divided. The register depth of the vessel is also to be taken at this point. (Fig. 11.)

TRANSFER OF SECTIONS TO KEELSON.

ART. 9. (*a*) The tonnage length having been determined, and the number of sections to be measured and the interval between them ascertained, a line is then to be extended down the main hatchway, at the middle line of the ship, in a direction prependicular to the keel, by means of a square placed on the upper side of the keelson.

(*b*) The distance of the midship section from this line at the tonnage deck is then to be set off from the line in the same direction on the keelson, which gives the position of the midship section on the keelson, and the positions of the other sections are obtained on the keelson by setting off afore and abaft of the midship section the common interval between them as already determined.

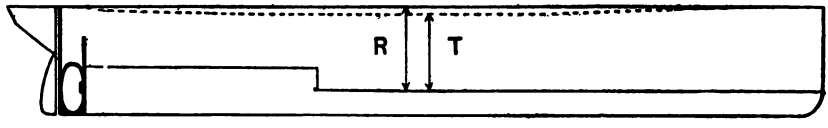


FIG. 11.—Register and tonnage depths of vessels with a break in the double bottom. R represents register depth; T represents tonnage depth.

ROUND OF BEAM.

ART. 10. (*a*) The round-up or spring of the beam, which must be known before taking the exact length of the vessel, as well as before measuring the depths of the areas, may be taken either at the under side of the deck, by stretching a small line tightly from end to end of the top of the beam, which will show the round or spring of the beam at the center; or it may be taken, if more convenient, at the upper side of the deck, by stretching a line tightly across, held at equal heights from the deck at each side of the ship, so as just to touch the crown of the deck at the middle line; then the distance from the deck to the line at the ship's sides gives the round-up or spring of the beam. It is necessary to take the round of beam at each point of division of the length except when the vessel has a parallel or nearly parallel breadth. In lieu of the above methods, it may be ascertained on the basis of one-fourth of an inch to the foot of beam at each section in iron or steel vessels of the usual camber of beam. This method is more accurate and easier of application than the others.

(*b*) The round or spring of the beam is the perpendicular distance from the crown of the under side of the tonnage-deck plank, at the center, to a line stretched athwart the vessel from end to end of the top of the beam, and is to be ascertained at every place where it is to be used in the measurement.

TRANSVERSE AREAS.

ART. 11. (*a*) Then, the hold being sufficiently cleared to admit the required depths and breadths being properly taken, proceed to find the transverse area at each point of division of the length, as follows:

(*b*) Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below the tonnage deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the ceiling, if any, on the floor timbers or frames, otherwise to the upper side of the floor timber or frame, at the inside of the limber strake. (Fig. 7, p. 10.)

In vessels with a raised platform in the bottom and no ceiling fitted, the depths are to be taken down through the platform to the upper side of the usual floor timbers, deducting therefrom the thickness of the platform in question.

Where transverse sections fall in holds, insulated for refrigerating purposes, and the insulation at the bottom extends more than 3 inches above the top of the floors or double bottom, a maximum allowance of 3 inches may be made; but if such insulation is less than 3 inches thick, only the actual thickness may be allowed; that is, the depths will be taken to the top of it, as in the case of ordinary ceiling. But no allowance will be made for insulation at the under side of decks.

(*c*) Then, if the depth of the midship division of the length do not exceed 16 feet, divide each depth into four equal parts.

(*d*) Then measure the inside horizontal breadth at each of the three points of division, marked on the sliding rods placed in position as directed in art. 56 (*b*), and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling or cargo battens which are between the points of measurement, or, should there be no ceiling or battens between these points, to the inside of the ordinary frames, not to the web or strengthening frames.

Where transverse sections fall in holds, insulated for refrigerating purposes, and the insulation on the sides thereof extends beyond the edges of the frames and is thicker than the ceiling similarly situated elsewhere in the ship, a maximum allowance of 3 inches on each side may be made for ceiling. But, if the insulation is less than 3 inches thick, allow the actual thickness thereof; that is, take the breadths to the faces of the insulation, as in the case of ordinary ceiling.

In small vessels with "false ceiling" in the portion of their cabins in their holds or forming a part of their seats or lockers, etc., therein, and which stands off from their frames—that is, not fitted to them as ordinary ceiling—take the breadths through the said "false ceiling" to the inner faces of the vessel's frames, deducting therefrom the thickness of the "false ceiling" on each side. If, however, there is a ceiling fitted on the frames, in adition to the "false ceiling," take the breadths to the ceiling on the frames, making no allowance for the "false ceiling."

(*e*) In finding the upper breadth of each transverse section, make no allowance for the excess of the deck-beam shelves, etc., over the average thickness of ceiling, if any, thereunder; that is, it is to be taken between the lines of the inner faces of the said ceiling, if any; otherwise to the lines of the inner faces of the frames of the vessel.

Referring to Fig. 7, it will be observed that after the deck is laid the upper breadth (represented by the line G H) passes through the deck on each side. Hence it is impossible to take it at its true position. In such cases take it on the deck, allowing within the rough tree timbers the thickness of the ceiling on the sides of the vessel under deck, if any, as shown by line X Y in the figure.

Owing to deck-beam shelves or other obstructions, it can be more conveniently and accurately taken here than under the deck, and, besides, it will be only 4 to 6 inches from its true position. In vessels which have upright sides the said breadth so taken will be correct, but in the case of vessels with inclining sides the necessary allowance must be made for the deviation of the sides from the upright in the 4 or 6 inches above the true position of the said breadth.

In the case of three-deck vessels, take the upper breadth of each transverse section on the tonnage deck in the same manner.

(*f*) The bottom breadths are to be taken only so far as the apparent flat of the floor extends. Where there is a perceptible rise immediately from the keelson, the bottom breadth is equal to the width of the keelson.

(*g*) Number these breadths from above, numbering the upper breadth 1 and so on down to the lowest breadth.

(*h*) Multiply the second and fourth by 4, and the third by 2.

(*i*) Add these products together and to the sum add the first breadth and the last, or fifth.

(*j*) Multiply the quantity thus obtained by one-third of the common interval between the breadths and the product shall be deemed the transverse area.

(*k*) But if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before, multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

(*l*) This process will be repeated at every section. Care should be taken in all measurements to bring them to the average thickness of the ceiling to avoid any device to lessen the measurement by making the ceiling thicker at the point cut by the sections. Care must also be taken that the sections shall be parallel to each other and at right angles to the axis of the vessel.

(*m*) The intervals and one-third intervals between the breadths are to be carried to the nearest hundredth of a foot, and the interval and one-third interval between the areas to the nearest thousandth of a foot.

SIDE WATER-BALLAST TANKS.

ART. 12. In vessels having side water-ballast tanks extending up from the top of the double bottom wholly or partly to the deck above and certified by the collector to be available for water ballast only, the breadths should be taken to the inside of said water-ballast tank. (Figs. 12 and 13.)

EXTENDED DOUBLE BOTTOMS.

ART. 13. When the extended double bottom stops short of the tonnage deck, divide each cross section in way of it into two parts, one extending from the top of the double bottom to its termination on the side and the other from this point to the tonnage deck above;

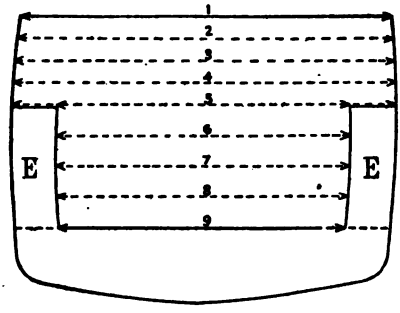


FIG. 12.—Divisions and breadths for finding areas of cross sections of vessels with double bottoms for water ballast extended partly to tonnage deck.

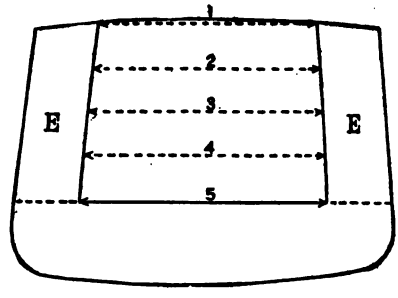


FIG. 13.—Breadths for finding areas of cross sections of vessels with double bottoms for water ballast extended wholly to tonnage deck.

In Figs. 12 and 13, E represents extended double bottom.

then find the area of each part separately as provided for finding the areas of cross sections and add together the areas of the two parts to get the total area of the cross section. (Fig. 12.)

DOUBLE BOTTOMS.

ART. 14. (*a*) In the case of a vessel constructed with a double bottom for water ballast the depth shall be taken from the under side of the tonnage deck to the upper side of the inner plating of the double bottom, allowing for ceiling, if any, thereon. No allowance, however, is to be made for the thickness of scantlings, if any, laid on the double bottom for supporting the ceiling.

(*b*) When the top of the double bottom is not horizontal but sloping up immediately from the center, divide the depths into five or seven equal parts, according as the midship depth is 16 feet, or less or more than 16 feet. If said depth do not exceed 16 feet divide each depth at the point of division of the length into five equal parts; then measure the inside horizontal breadth at each of the four points of division and also at the upper point of the depth, extending each measurement to the average thickness in that part of the ceiling which is between the points of measurement. Number these breadths from above (i. e., numbering the upper breadth 1, and so on down to the fifth breadth); multiply the second and fourth by 4, and the

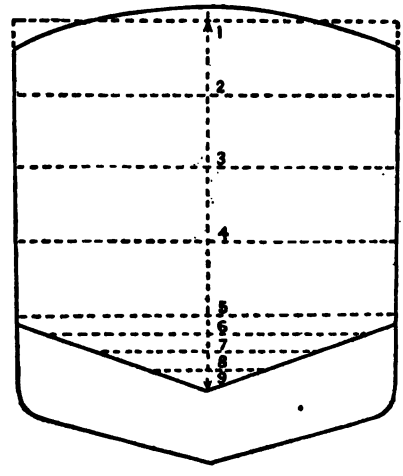


FIG. 14.—Divisions of depths of cross sections of vessels with double bottoms sloping up immediately from the center.

third by 2; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area of the upper part of the section.

(*c*) Then find the area between the fifth and lower point of the depth by dividing the depth between such points into four equal parts, and measure the horizontal breadths at the three points of division and also at the upper and lower points, and proceed as before, and the sum of the two parts shall be deemed to be the transverse area. (Fig. 14.)

(*d*) But if the midship depth exceed 16 feet, divide each depth into seven equal parts instead of five, and measure, as before directed, the horizontal breadths at the six points of division, and also at the upper point of the depth; number them from above, as before; multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together, and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area of the upper part of the section; then find the lower part of the area, as before directed, and add the two parts together, and the sum shall be deemed the transverse area.

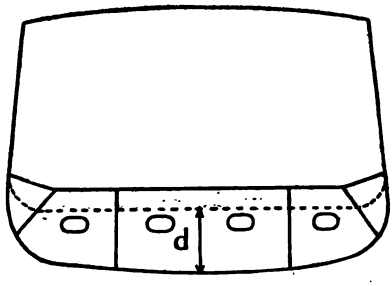


FIG. 15.—Floor allowance in double bottoms used other than for water ballast, and in bulk-oil carriers. *d* represents depth of floors allowed.

(*e*) Vessels with horizontal double bottoms are to be measured under the ordinary rule.

DOUBLE BOTTOMS WITH CARGO, STORES, OR FUEL.

ART. 15. (*a*) If the space between the inner and outer plating of the double bottom is available only for water ballast, it is exempt from measurement; but if it is available for carrying cargo, stores, feed water, coal or other fuel, the portion of it between the top of the floors, if any, otherwise between the line of the floors allowed (as per the following schedule and Fig. 15) and the inner plating, is to be included in the space under the tonnage deck.

(*b*) The depth of the said portion of a cellular double bottom used other than for water ballast is to be taken from the under side of the top of the said double bottom to the line of the top of the floors allowed, and the depth of such floors measured from the shell plating upward alongside of the center through plate keelson shall be as follows:

For vessels whose molded breadth is 15 to 16 feet, 0.75 foot; 16 to 17 feet, 0.8 foot; 17 to 18.5 feet, 0.85 foot; 18.5 to 19.5 feet, 0.9 foot; 19.5 to 21 feet, 0.95 foot; 21 to 22 feet, 1 foot; 22 to 23 feet, 1.05 feet; 23 to 24 feet, 1.1 feet; 24 to 25 feet, 1.15 feet; 25 to 26 feet, 1.2 feet; 26 to 27 feet, 1.25 feet; 27 to 28 feet, 1.3 feet; 28 to 29 feet, 1.4 feet; 29 to 30 feet, 1.5 feet; 30 to 31 feet, 1.6 feet; 31 to 32 feet, 1.65 feet; 32 to 33 feet, 1.75 feet; 33 to 34 feet, 1.8 feet; 34 to 35 feet, 1.9 feet; 35 to 36 feet, 2 feet; 36 to 37.5 feet, 2.05 feet; 37.5 to 38.5 feet, 2.1 feet;

38.5 to 40 feet, 2.15 feet; 40 to 41 feet, 2.2 feet; 41 to 42 feet, 2.25 feet; 42 to 43 feet, 2.3 feet; 43 to 44 feet, 2.35 feet; 44 to 45.5 feet, 2.4 feet; 45.5 to 46.5 feet, 2.45 feet; 46.5 to 48 feet, 2.5 feet; 48 to 49 feet, 2.55 feet; 49 to 50 feet, 2.6 feet; 50 to 51 feet, 2.65 feet; 51 to 52 feet, 2.7 feet; 52 to 53 feet, 2.75 feet; 53 to 54 feet, 2.8 feet; 54 to 55.5 feet, 2.85 feet; 55.5 to 56.5 feet, 2.9 feet; 56.5 to 58 feet, 2.95 feet; 58 to 59 feet, 3 feet. (Fig. 15.)

For vessels of a greater breadth allow 0.05 of a foot for every additional foot of molded breadth.

(*c*) This schedule of floor depths applies to vessels whose molded depth is at least 55 per cent of the molded breadth; for vessels whose molded depth is less than 55 per cent of the molded breadth, apply to the Bureau of Navigation for instructions.

(*d*) The part of the double bottom (cellular) above the floors allowed, as defined above, used other than for water ballast, is to be measured in the same manner as between decks (art. 19), if the double bottom extends without a break or breaks the full length of the vessel. It may be considered as extending the full length of the vessel where the peak tanks at the ends of it are used in the same manner as itself. When the double bottom so used extends with a break or breaks the full length of the vessel, or when it is situated between peak tanks used for water ballast, or when only a portion or portions of it are so used the part or parts required to be added as defined above are to be measured in the same manner as closed-in erections on or above the upper deck, which are available for cargo or stores, etc. (Art. 21.)

In the case of vessels with deep double bottoms or deep tanks at the bottom, having ordinary floors therein, used other than for water ballast, the portion of such spaces above the floors shall be measured and included in the tonnage of the space under the tonnage deck by extending the transverse sections in way of them to the top of the said floors, as in the case of vessels with a raised platform in the bottom.

BULK-OIL CARRIERS.

ART. 16. In the case of bulk-oil carriers the above schedule for floor allowance is to be applied. The register depth of such vessels is the perpendicular depth of the midship section from the under side of the deck plating or planking on the deck beams to the outer plating or planking of the hull at the bottom, less the floor allowance determined according to the molded breadth of the vessel in question. The tonnage depth of each transverse section is the depth similarly taken less the said floor allowance, and, in addition, one-third of round of beam of the section in question.

CUBICAL CONTENTS UNDER TONNAGE DECK.

ART. 17. (*a*) Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

(*b*) Number the areas successively 1, 2, 3, etc., No. 1 being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern.

(*c*) Then, whether the length be divided according to the table, into 6 or 16 parts, as in classes 1 and 6, or any intermediate number, as in classes 2, 3, 4, 5, multiply the second and every even-numbered area by 4, and the third and every odd-numbered area, except the first and last, by 2.

(*d*) Add these products together and to the sum add the first and last, if they yield anything;[1] multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck.

(*e*) Divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed to be the register tonnage of the vessel, subject to the additions hereinafter mentioned.

SPECIAL EXEMPTED WATER-BALLAST PEAKS, ETC.

ART. 18. Any space other than the double-bottom space used only for water ballast, certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel shall be deducted from the gross tonnage, as measured, to get gross register tonnage. (Act of Congress, Feb. 6, 1909.)

BETWEEN DECKS.

If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

ART. 19. (*a*) Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern when ceiled; but if there is no ceiling, take the length in the manner directed for taking tonnage lengths in such cases. Divide the length into the same number of equal parts into which the length of the tonnage deck is divided.

(*b*) Measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth of the stern (if round, as in the case of poops of similar form); number them successively 1, 2, 3, etc., commencing at the stem; multiply the second and all other even-numbered breadths by 4 and the odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space.

(*c*) Measure the mean height between the planks of the two decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel, ascertained as aforesaid.

(*d*) If the vessel has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as aforesaid.

HATCHWAYS.

ART. 20. The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of the beam to the under side of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage of the ship

[1] The extreme points of the length at the bow and stern, though described as being the positions of the first and last areas, do not, in vessels of usual form, yield any area, as the vertical transverse section at each of those places vanishes into a mere horizontal line. Therefore, in the computation for tonnage, where the first and last areas form part of the process, a cipher must be employed in their places. But in vessels of unusual form, as, for instance, in barges or other craft in which the bow and stern are upright, with breadth also at those places, the extreme points of the length will yield areas; in which cases such areas must be measured and used in the computation as the rule directs.

exclusive of the tonnage of the hatchways, and the remainder only shall be added to the said gross tonnage.

DECK HOUSES AND SPACES ON THE UPPER DECK.

ART. 21. (*a*) Nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather—that is, not inclosed.

(*b*) If there be a break, a poop, or any other permanent closed-in space on or above the upper, or spar, deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of such space (except the cabins and staterooms for passengers on a deck not to the hull exempted by law) shall be ascertained as follows and added to the tonnage of the vessel:

(*c*) Measure the internal mean length of such space in feet and divide it into an even number of equal parts, the common length of which shall be most nearly equal to that of the parts into which the length of the tonnage deck has been divided.

(*d*) Measure at the middle of its height the inside breadths, namely, one at each end and at each of the points of division, numbering

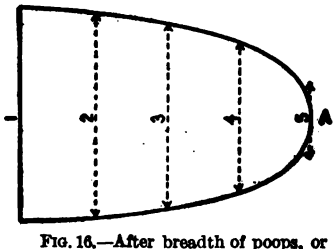


FIG. 16.—After breadth of poops, or between decks of similar form, on round (elliptical) stern vessels.

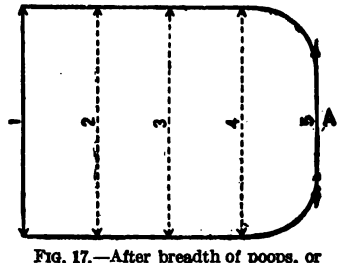


FIG. 17.—After breadth of poops, or between decks of similar form, of the type of round-stern vessels as found on the Lakes.

In figs. 15 and 16 A represents after breadth.

them successively 1, 2, 3, etc., then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last.

(*e*) Multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space.

(*f*) Then measure the mean height between the planks of the decks, and multiply by it the mean horizontal area, divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage deck ascertained as aforesaid.

AFTER BREADTHS OF POOPS ON ROUND-STERN SHIPS.

ART. 22. If the after part of an ordinary poop is elliptical, make the breadth at the aft (extreme) end equal to one-half of the preceding one, but if it is round, as usually found on lake vessels, two-thirds of the preceding one. Take the length of said space at half height along the middle line from the inside of the frames, or stiffeners, of the forward bulkhead to the inside of the stern frame when no ceiling is present. Make division of the length as aforesaid. Measurements of the other unceiled addible erections on or above the upper deck are to be taken inside of the frames, or stiffeners, of the same. (Figs. 16 and 17.)

DECK ERECTIONS.

ART. 23. (*a*) In deciding whether or not deck erections are permanent closed-in spaces on the upper deck and should be measured and added to the tonnage, the measurer should have regard to the character and structural condition of such erections on the upper deck at the time when they are presented to his notice.

(*b*) Poops, bridges, or any other erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing, but otherwise so closed in as to be not only available but also actually fitted and used for the berthing or accommodation of passengers, must be measured and added to the tonnage.

CLOSED-IN SPACES WHICH MAY BE EXEMPTED.

ART. 24. The following exceptions to the general rule of measuring all closed-in or weather-protected spaces on or above the upper deck are allowed:

(*a*) Any closed-in space or spaces solely appropriated to and fitted with machinery.

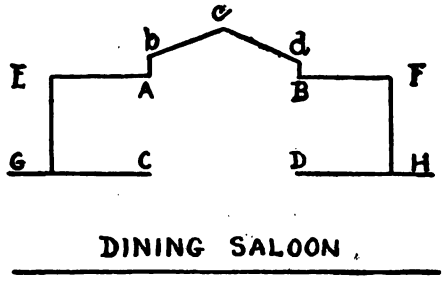


FIG. 18.—*A b c d B* is the skylight serving the superstructure EFGH, and ABCD is the portion of the superstructure directly under the skylight and over the opening in the floor of the superstructure, affording light and ventilation to the dining saloon below.

(*b*) The wheelhouse for sheltering the man or men at the wheel.

(*c*) The cookhouse and also the bakeries when fitted with ovens and used entirely for such purposes.

(*d*) The condenser space.

(*e*) Water-closets or privies for the officers and crew; and in the case of vessels fitted particularly for passengers, an additional one may be allowed for every 50 persons; not more than 12 are, however, generally necessary.

(*f*) Skylights and domes affording ventilation, light, and air to the erection served, but none of the space below the roof or covering of such erection is exempt except where an opening is left in the floor of the superstructure directly under the skylight to give ventilation and light to a dining saloon, etc., below the said floor. This additional exemption, however, is to be approved by the Commissioner of Navigation. The request for such approval is to be accompanied by a blue print or sketch of the said space. (Fig. 18.)

(*g*) Companions, except the portion of them used as a smoking room, and booby hatches used exclusively to protect companionways and ladders leading to spaces below, whether such spaces are exempt or not. But such companionways as are not in exempted spaces will be included in gross tonnage and deducted therefrom in in ascertaining the net tonnage, if serving exclusively deducted spaces.

Provided always that the spaces are no larger than required for the purposes mentioned.

SHELTER-DECK SPACES.

ART. 25. (*a*) Subject to the foregoing exception, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing them, should not be measured and included in the tonnage.

The tonnage openings in the bulkheads of such open, isolated erections as forecastles, bridges, and poops may be temporarily closed by sliding or shifting boards let into channel bars at the sides of such openings, or by plates or boards held in place by cross pieces or hook bolts, spaced not under 1 foot apart, grasping the angular stiffeners at the sides of such openings. But in no case is battening or gaskets of any material permitted. The same temporary means of closing, except by plates, the tonnage openings in the bulkheads of the well under the tonnage opening in a shelter deck and in the intermediate bulkheads thereunder (shelter deck), are permitted.

(*b*) The minimum width and height of the permanent openings in the bulkheads are fixed at 3 feet and 4 feet, respectively, and if coamings are fitted thereto their height must not exceed 2 feet.

(*c*) A single opening at one side of a bulkhead is not considered sufficient to entitle the space thus partitioned off to exemption, unless, in addition to this, there are a number of freeing ports and scuppers fitted on each side of the space claimed. In such cases the owner's application for exemption and also a sketch of the space drawn to scale must be forwarded to the Commissioner of Navigation for examination, and exemption must not be allowed without the Bureau's approval.

(*d*) When exemption from measurement is claimed for the space between the upper and shelter decks on the ground of a permanent middle-line opening in the shelter deck, the length of this opening must not be less than 4 feet clear, and the width must at least be equal to that of the after cargo hatch upon the same deck. The distance between the after edge of the deck opening and the aft side of the sternpost must not be less than one-twentieth the registered length of the vessel, or if the opening is placed forward, the fore side must not be less than one-fifth the length of the vessel from the stem. When the permanent deck opening is situated aft, there must be at least two openings in all the transverse bulkheads in the between decks on the fore side of it to entitle the space to exemption, and these openings must comply as regards dimensions and size of coamings (if any) with the requirements of paragraph (*b*) above.

(*e*) There must also be on each side at least one freeing port of good size abreast the deck opening and a suitable number of scuppers not less than 3½ inches in diameter distributed throughout the space.

(*f*) The coamings to the deck opening must not exceed 12 inches mean height above the deck, and the opening must be fenced with guardrails and stanchions, the latter being so fitted as not to lend themselves to battening down the opening.

(*g*) If portable wood covers are fitted, the lashings beneath for holding them down are to be of hemp.

(*h*) All openings in the upper deck must be provided with proper means for closing and battening down.

SHELTER FOR DECK PASSENGERS.

ART. 26. Cabins and staterooms immediately on the upper deck to the hull, permanently "closed in" and fitted up for permanent use of passengers, are to be included in the gross tonnage. They will be exempted only when they have no berthing accommodations and have only temporary arrangements to protect passengers on short voyages from rain and the shipment of seas, constituting sheltered spaces above the upper deck under cover and open to the weather; that is, not inclosed.

SPECIAL PASSENGER ACCOMMODATIONS.

ART. 27. (*a*) No part of any vessel will be measured or registered for tonnage that is used for cabins or staterooms, and constructed entirely above the first deck which is not a deck to the hull (R. S., 4151). Such cabins and staterooms must be set apart exclusively for passengers; and when occupied by the officers or other members of the crew, wherever situated, they shall be included in gross and deducted therefrom in ascertaining the net tonnage.

(*b*) In the case of Army transports, colliers, supply ships, hospital ships, etc., the term "passengers" shall include all officers, enlisted men, and other persons who are not assigned to ship's duties and not entered on the ship's articles, and no deductions for spaces occupied by such persons shall be made, nor are cabins and staterooms occupied by them to be included in gross tonnage when situated on a deck not a deck to the hull.

DECK TO THE HULL.

ART. 28. The uppermost deck, extending from stem to stern, which has a direct bearing upon the frame timbers, or a portion of them, and also to which the hull extends continuously with none of the openings required in shelter deck spaces from stem to stern, even though lighter than other decks in the vessel, having its hatchways or other openings provided with means for closing them against the action of the sea and weather upon the space below inclosed by the sides of the vessel, and making the said space a fit place for the stowage of general cargo, like a hold, is the upper deck to the hull; that is, it is the uppermost continuous deck within the boundaries of the hull. Partial decks above this, even though supported by the frames of the vessel, are not to be regarded as decks to the hull.

RECORD OF EXCLUDED SPACES.

ART. 29. (*a*) The tonnage measurement of all spaces above the upper deck that the measurer has not included in the gross tonnage of the vessel should be given in detail on Catalogue 1410, "Tonnage admeasurement," which, if forwarded to the Bureau for test and examination, should be accompanied by any plans, sketches (drawn to scale), or explanation required for the proper consideration of the exemption of such spaces.

(*b*) Should there be no spaces above the upper deck which have been exempted, this should be noted on Catalogue 1410, "Tonnage admeasurement."

(*c*) The measurer should be careful to record in the space provided on the above form the principal dimensions, tonnage, and position of all spaces above the upper deck that are not included in the cubical contents forming the ship's registered tonnage.

(*d*) All doubts arising in the minds of the measurers concerning decks to the hull, inclosures on or above the upper deck, shelter decks, and all other points, accompanied by sketches of the spaces and all the facts bearing on the same, should be submitted to the Commissioner of Navigation for his decision.

MOTOR BOATS.

ART. 30. In motor boats, having the engine in a house used for other purposes, exempt so much of the space above deck as equals the product of length of the engine plus 2 feet by one-half the breadth of the boat at that part by the height of said house.

OPEN VESSELS.

ART. 31. In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary line of measurement, and the depth shall be taken from an athwartship line extending from the upper edge of said strake at each division of the length.

NET TONNAGE—DEDUCTIONS FROM GROSS TONNAGE.[1]

GENERAL RULE.

ART. 32. The deducted spaces when bounded by practically flat surfaces, as ordinary crew spaces, etc., are to be measured by taking the product of the three dimensions, but when bounded by one or more curved surfaces they are to be measured according to the Moorsom system, as applied in the measurement of peak tanks and deck erections.

DEDUCTIONS.

From the gross tonnage of every vessel of the United States there shall be deducted—

CREW SPACES.

ART. 33. The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. In spaces appropriated to the use of the crew may be included passageways serving exclusively such spaces, spaces reasonable in extent, necessary to shelter the cook when employed in the preparation of provisions, the engineer when employed in condensing water for the crew, the chief engineer's office used exclusively in official duties, and the wireless operator when engaged in his work or where he may be berthed, water-closets or privies, mess rooms and bathrooms or washrooms exclusively for the use of the officers and crew. But none of these spaces when used by or for the passengers are to be deducted, nor is the clerk's, purser's, or paymaster's office to be deducted.

[1] Gross tonnage referred to in the following articles is the gross register tonnage—i. e., the gross tonnage exclusive of all exemptions including water ballast, etc. This to be the basis of all percentage deductions, such as propelling power, boatswain's stores, storage of sails, etc.

PENALTY FOR OBSTRUCTING CREW SPACES.

NOTE.—Every place for berthing the crew shall be kept free from goods or stores not the personal property of the crew in use during the voyage, with the exceptions noted below, and, if any such place is not so kept free, the master shall forfeit and pay to each seaman or apprentice lodged therein the sum of 50 cents per day for each day during which any goods or stores as aforesaid are kept or stored therein after complaint has been made to him by any two or more of the seamen so lodged.

MARKING OF CREW SPACES.

ART. 34. No deduction shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate, or purpose for which used, with these words, "Certified to accommodate —— seamen," "Certified mess room," "Certified W. C.," etc.

DIMENSIONS AND REQUIREMENTS OF CREW SPACES.

NOTE A.—Every place appropriated to the crew of a seagoing vessel of the United States, except a fishing vessel, yacht, a pilot boat, and all vessels under 200 tons register, built prior to November 4, 1915, shall have a space of not less than 72 cubic feet and not less than 12 square feet measured on the deck or floor of that place for each seaman or apprentice lodged therein: *Provided*, That any such seagoing sailing vessel, built or rebuilt after June 30, 1898, and prior to November 4, 1915, shall have a space of not less than 100 cubic feet and not less than 16 square feet measured on the deck or floor of that space for each seaman or apprentice lodged therein. Such place shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water: *Provided further*, That on all merchant vessels of the United States the construction of which shall be begun after November 4, 1915, except yachts, pilot boats, or vessels of less than 100 tons register, every place appropriated to the crew of the vessel shall have a space of not less than 120 cubic feet and not less than 16 square feet measured on the floor or deck of that place for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

HOSPITAL SPACES.

NOTE B.—That in addition to the space allotment for lodgings hereinbefore provided on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of 12 or more seamen, there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and

such compartment shall have at least one bunk for every 12 seamen constituting her crew, provided that not more than six bunks shall be required in any case.

WASH ROOMS AND BATHROOMS.

NOTE C.—All merchant vessels of the United States the construction of which shall be begun after November 4, 1915, having more than 10 men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine room men, if their number exceed 10, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of washbasins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than $50 nor more than $500: *Provided,*

FUMIGATION.

NOTE D.—That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

NOTE E.—Fishing vessels, yachts, and pilot boats are specially exempted from the provision of section 1 of the act of March 2, 1895, and yachts, pilot boats, and vessels under 100 tons from the provisions of the act of March 4, 1915, so far as regards the amount of space which shall be appropriated to the crew, and from the provision that said space shall be kept free from goods or stores not the personal property of the crew in use during the voyage. (Act of Mar. 3, 1897.)

MISSISSIPPI RIVER STEAMBOATS.

NOTE F.—Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew which shall conform to the requirements of section 2 of the act of March 3, 1897, and section 2 of the act of March 4, 1915, so far as they shall be applicable thereto, by providing sleeping room in the engine room, properly protected from the cold, winds, and rain by means of suitable awnings or screens on either side of the guards, or sides, and forward, reaching from the boiler deck to the main or lower deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

MASTER'S CABIN.

ART. 35. Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space. This space includes sleeping room, dressing room, bathroom, office, and passageways serving the master's accommodations, but each such space shall be stated separately on the certificate of registry.

NAVIGATION SPACES, ETC.

ART. 36. Any space reasonable in extent used exclusively for the working of the helm, the capstan, and the anchor gear, when below deck, or for keeping the charts, signals, lamps, and other instruments of navigation and boatswain's stores and the words: "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

The space commonly known as chain locker is to be considered and, subject to the above restrictions, treated as space for anchor gear. When the space in the fore peak under the tonnage deck is so used, as is often done in wooden vessels, it is to be measured in the manner prescribed for measuring fore-peak tanks for water ballast.

In small vessels (requiring navigation charts) where the cabin or saloon is the only space available for filing or use of such charts, one-half of the cabin or saloon, but not more than 3 tons, may be allowed for this purpose.

As a rule, the allowance for boatswain's stores should not exceed 1 per cent of the gross tonnage in vessels of 1,000 tons gross and upward; but this allowance should not exceed 75 tons in any ship, however large. In vessels from 500 to 1,000 tons gross, the reasonable limit is about 10 tons, and in vessels of 150 to 500 tons 2 per cent of the gross tonnage may be allowed. In vessels under 150 tons, this allowance, as a rule, should not exceed 3 tons.

DONKEY ENGINE AND BOILER.

ART. 37. (*a*) The space occupied by the donkey engine and boiler, if situated within the boundary of the engine room or the casing above it, and if the said donkey engine is used in connection with the main machinery for propelling the vessel and forms part of the actual engine room, should not be the subject of a separate allowance.

(*b*) When the donkey boiler is in a house above the upper deck and not connected with the main machinery as described above, it is not subject to measurement in the gross tonnage of the ship, and therefore must not form a deduction.

(*c*) In all other cases the space occupied by the donkey engine and boiler, if connected with the main pumps of the ship, is to be allowed as a deduction from the tonnage, if reasonable in extent and properly and efficiently constructed. It must be marked as other deducted spaces, showing the use to which it is to be put.

STORAGE OF SAILS.

ART. 38. In the case of a vessel propelled wholly by sails, any space, not exceeding two and one-half per cent of the gross tonnage, used exclusively for the storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent, properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

PROPELLING-POWER PERCENTAGES.

In the case of a vessel propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made as follows:

ART. 39. (*a*) In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above 20 per cent and under 30 per cent of the gross tonnage, the deduction shall be 37 per cent of the gross tonnage.

(*b*) In vessels propelled by screws in which the tonnage of the space is above 13 per cent and under 20 per cent of the gross tonnage, the deduction shall be 32 per cent of the gross tonnage.

(*c*) The shaft-trunk space shall be deemed necessary for the proper working of the machinery and considered a part of the propelling-power space.

(*d*) In the case of vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to 20 per cent or under of the gross tonnage of the vessel, the deduction shall consist of one and one-half times the tonnage of the actual machinery space.

(*e*) In the case of screw vessels, when the machinery space is 13 per cent or less of gross tonnage, of one and three-fourths times the tonnage of the actual machinery space.

(*f*) But if the actual machinery space is so large as to amount in the case of paddle vessels to 30 per cent or above, and in the case of screw vessels to 20 per cent or above, of the gross tonnage of the vessel, the deduction shall consist of 37 per cent of the gross tonnage in the case of a paddle vessel and 32 per cent of the gross tonnage in the case of a screw vessel.

(*g*) Or, if the owner prefers, there shall be deducted from the gross tonnage of the vessel the tonnage of the space, or spaces, actually occupied by, or required to be inclosed for the proper working of the boilers and machinery, including the shaft trunk or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of 50 per cent, and in the case of vessels propelled by screws of 75 per cent of the tonnage of such space.

SPACES ABOVE CROWN OF ENGINE ROOM.

ART. 40. (*a*) On a request in writing to the Commissioner of Navigation by the owner of a vessel, the tonnage of such portion of the space, or spaces, above the crown of the engine room above the upper deck as is framed in for the machinery, or for the admission of light and air, and not required to be added to gross tonnage, shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the engine space; but it shall then be included in the gross tonnage. Such space, or spaces, must be reasonable in extent, safe, and seaworthy and can not be used for any purpose other than the machinery, or for the admission of light and air to the machinery or boilers, of the vessel. To get this benefit, the request must be accompanied with a description and sketch, or tracing, of the spaces, the measurement thereof, and the collector's certificate that such space, or spaces, conform to the requirements stated above.

(*b*) In construing the words "reasonable in extent" the measurer should note that the length should not exceed the length of the propelling space, and if any portion is plated over, the length of the plated part should be deducted from the full length; and whatever the breadth of the casing may be, no greater breadth is to be allowed for the purpose of propelling space deduction than one-half the extreme inside breadth of the ship amidships.

The purpose of the addition of the framed-in light and air spaces (above the crown of the boiler and engine room and above the upper deck) of a vessel to her machinery space below the upper deck, is to entitle her to a greater deduction for propelling power, and consequently a smaller net tonnage than she would otherwise obtain. To get this benefit, it does not always require the addition of the total of such light and air spaces. In such cases a portion only may be added.

Below is given a simple rule for finding the amount of light and air space or spaces required to be added to the gross tonnage and to the machinery space of a steam or other power vessel to entitle her to 32 per cent of her gross tonnage for propelling-power allowance, when granted by the Commissioner of Navigation upon request of her owner or owners:

Find the difference between 13.1 per cent of her gross tonnage, inclusive of excess hatchways (based on her gross tonnage exclusive of light and air spaces and hatchways), and exclusive of light and air spaces, and the machinery space below the upper deck to the hull; then increase this difference by 15 per cent of itself. This difference so increased gives approximately the amount of light and air space or spaces required to be added to the gross tonnage defined above and to the machinery space below the upper deck to the hull. The gross registered tonnage in such a case is the gross tonnage as defined above, plus the light and air addition, less one-half of 1 per cent of the said light and air addition (additional allowance for hatchways on account of light and air addition).

Example.

Gross tonnage exclusive of light and air and hatchways		5,675.95
Excess of hatchways (based on the above)		67.37
Gross tonnage, inclusive of excess hatchways, and exclusive of light and air		5,743.32
13.1 per cent of 5,743.32	752.37	
Machinery space below the upper deck to the hull	680.55	
Difference	71.82	
15 per cent of difference	10.77	
Difference plus 15 per cent of itself (amount of light and air to be added to gross tonnage and machinery space)		82.59
Gross tonnage inclusive of light and air and excess of hatchways		5,825.91
Additional exemption for hatchways; account of light and air addition equals one-half of 1 per cent of 82.59=82.59/200		.41
Gross registered tonnage		5,825.50
Proof:		
13.1 per cent of 5,825.50		763.14
680.55 plus 82.59		763.14

MEASUREMENT OF ENGINE ROOM.

ART. 41. Notwithstanding the ratable allowance for propelling power for which the act of March 2, 1895, provides, the measurers will observe that it will always be necessary to measure the engine room, whatever may be its size, in order to ascertain whether the allowance to be deducted for the propelling power is to be regulated by the general percentage prescribed by the act or by the actual contents of the engine room ascertained by measurement.

SPACES INCLUDED IN ENGINE ROOM.

ART. 42. (*a*) By the space occupied by the engine room is to be understood that occupied by the engine room itself and the boiler room, together with the spaces strictly required for the working of the engines and boilers, and consists of the following items: (1) Space below the crown of the engine room, as defined below; (2) space between the crown and the upper deck framed in for the machinery, or for the admission of light and air; (3) space similarly framed in above the upper deck when permitted under paragraph (*i*), act of March 2, 1895; and (4) the contents of the shaft trunk or trunks in screw vessels, including the trunked ladderway leading from the after part of the shaft trunk to the deck, provided that it is no larger than is necessary for the purpose of access to and escape from the shaft trunk.

(*b*) The crown or top of the main space of the actual engine room, from which the depth of the main space is to be taken, will either be at the under side of a deck or, if the side bulkheads are curved, at the point or height at which the curve terminates.

(*c*) In the case of engine rooms of irregular form, the space is to be measured in parts with a view to obtaining the correct cubic contents.

(*d*) As a rule, the length of the engine room extends from the bulkhead forward of the boilers to the one aft of the engines; but if these bulkheads limit a space too great for the proper working of the boilers and engines, then that length only is to be measured which is requisite for containing the boilers and machinery, with the addition, when the fire grates are in a fore-and-aft direction, of such length as is necessary for the stoking or working of the fires in a fore-and-aft direction clear of the machinery or forward bulkhead. The additional length on this account may be about 1 foot more than the length of the fire grates. In any case where it may appear to the measurer that a greater length should be allowed, he must submit all particulars, with plans, to the Commissioner of Navigation for consideration.

(*e*) No such additional length is, however, required when the boilers are placed with the fire grates athwartship, as in such a case the stoking or working of the fires in an athwartship direction does not interfere with the position of the engines or bulkhead. The clear central space allowed between the boilers, when the stoking is athwartship, should be sufficient for this purpose. The point to which the after boundary of the length of the engine room is to be measured should be no farther aft of the after cylinder or of its valve casing than is necessary for safe working, which is about 4 feet aft

of such cylinder or valve casing. When it appears to the measurer that a greater length should be allowed, he must apply for instructions.

(*f*) Between the engines and boilers the measurer should allow such length as may appear to him necessary for the safe working of the machinery.

(*g*) The engine space between the crown of the main engine room and the upper deck, if any, is to be measured separately and its cubical contents added to the main space.

(*h*) In the case of a motor boat not having an engine room bulk-headed off from the rest of the hold, allow as engine space (basis for propelling-power allowance) the space occupied by the engine, and sufficient space on each side of it, say about 2 feet, to permit the operator to handle it safely and efficiently, if there is sufficient space for such allowance; otherwise allow whatever space there is. Fuel tanks and bunkers, storage batteries, or other engine accessories are not to be included in the said engine space.

SHAFT TRUNKS.

ART. 43. (*a*) When there is no built tunnel, the following rules should be observed in the case of a vessel with a single screw. The thrust-block space should be taken of such length and breadth as will admit of a man getting round it to remove the holding-down nut, and the height need not exceed 7 feet. The tunnel allowed should be of ordinary dimensions suitable for the vessel.

(*b*) When the vessel is a twin screw and the space aft of the engines is open from side to side, the space should not be included in the engine-room measurement for a greater height than 6 feet mean, and any space therein appropriated for stores or for any purpose other than the propelling power should be deducted from the space to be included in the engine room.

RULE FOR MEASUREMENT OF ENGINE SPACE.

ART. 44. (*a*) Measure the mean depth of the space from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three, breadths of the space at the middle of its depth, taking one of those measurements at each end and another at the middle of the length; take the mean of those breadths; measure also the mean length of the space between the foremost and aftermost bulkheads, or limits of its length, excluding such parts, if any, as are not actually occupied by, or required for the proper working of, the machinery; multiply together these three dimensions of length, breadth, and depth, divide the product by 100 and the result shall be deemed the tonnage of the space below the crown; then find the cubical contents of the space or spaces, if any, above the crown aforesaid, which are framed in for the machinery, or for the admission of light and air, by multiplying together the length, depth, and breadth thereof; add such contents to the cubical contents of the space below the crown; divide the sum by 100; and the result shall (subject to the provisions hereinafter contained) be deemed to be the tonnage of the space.

(*b*) If, in any ship in which the space for propelling power is to be measured, the engines and boilers are fitted in separate compartments, the contents of each shall be measured severally in like manner,

according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the said space.

(*c*) In the case of screw steamers in which the space for propelling power is to be measured, the contents of the shaft trunk shall be ascertained by multiplying together the mean length, breadth, and depth of the trunk, and dividing the product by 100.

DEDUCTIONS FROM ENGINE ROOM.

ART. 45. The cubical contents of the engine space having been ascertained as described above, the cubical capacity of any cabins or storerooms which may be fitted in the engine room, and also any space occupied by machinery not used in propelling the ship, must be deducted,[1] and the remainder being divided by 100 will be the net tonnage of the actual engine room.

SPECIAL RULE FOR DREDGERS.

ART. 46. The machinery spaces on the upper deck of dredgers towed from place to place on the Lakes, requiring to be documented, are to be exempted as in the case of other vessels, but no allowance for propelling power is to be made for such vessels on account of the machinery below deck that is used only for working the bucket, or scoop, and not for the propulsion of the vessel.

NET TONNAGE.

ART. 47. (*a*) The tonnage of a vessel remaining after the authorized deductions have been made shall be deemed to be the net, or register, tonnage.

(*b*) In ascertaining the net tonnage, no space is to be deducted unless it has previously been included in the gross tonnage.

(*c*) A register ton shall be 100 cubic feet.

MISCELLANEOUS.

FINAL RESULTS.

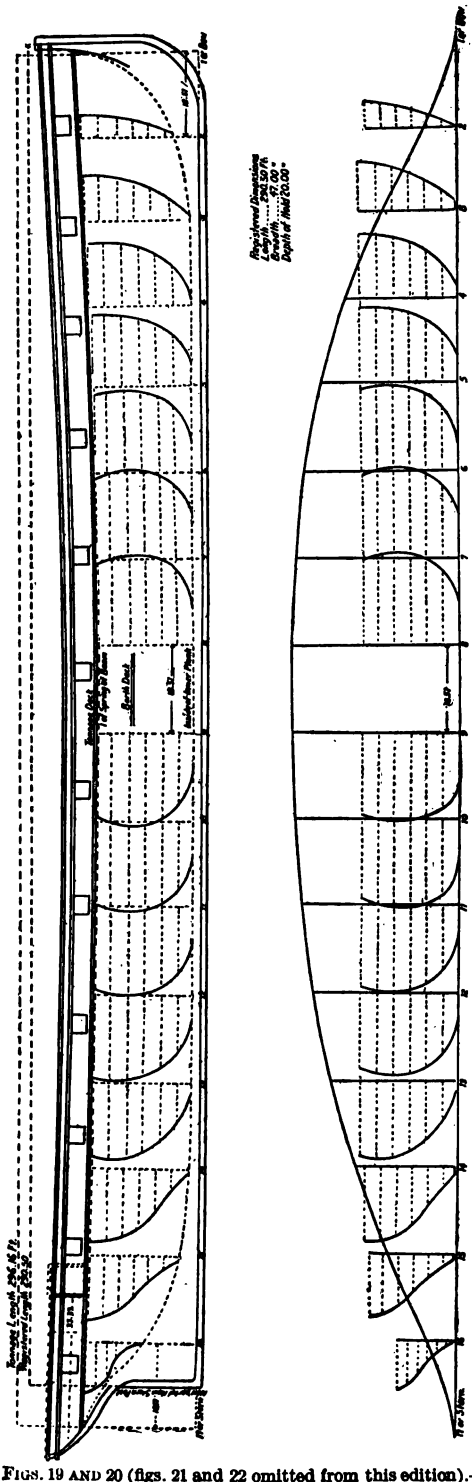
ART. 48. (*a*) Measurements and calculations based upon them must be made carefully and accurately. Calculations must be verified at least twice and a diagram of areas for half breadths made. (Figs. 19 and 20.)

(*b*) The measurements and calculations being complete, and the tonnage duly marked on the main beam, the surveyor or measuring officer will certify the result to the collector, and such certificate form (Cat. 1322) will be preserved as a permanent record in the custom-house.

MARKING AND RECORDING OF TONNAGE.

ART. 49. (*a*) The net tonnage (omitting fractions), together with the official number, must be marked on the face of the beam under the forward side of the main hatch of seagoing vessels and Lake vessels,

[1] Fuel oil settling tanks within the confines of the engine room of an oil-burning vessel, and used solely for rendering crude oil fit for consumption in the boiler furnaces, are considered as parts of the machinery for propelling the vessel; and the spaces occupied by the same will be included in the actual machinery space taken as the basis for the allowance for propelling power.



FIGS. 19 AND 20 (figs. 21 and 22 omitted from this edition).—Register and tonnage lengths, areas of half breadths, and the curve of areas of round-stern vessels.

and on the face of the beam under the after side of the starboard forward hatch of western river steamers. On river steamers of the coast which carry passengers both above and below main deck where there is no hatch to the main deck, the tonnage mark and official number should be made on one of the deck beams in a conspicuous place, and as near as possible to the middle of the vessel.

(*b*) It should be in plain Arabic numerals not less than 3 inches high and not less than three-eighths inch deep in vessels whose main beam is wood, and plainly cut or marked in oil paint, white when the beam is black, and black when the beam is of any light color, on vessels whose main beam is of steel or iron.

CHANGE OF TONNAGE.

ART. 50. The tonnage of any documented vessel of the United States expressed in her marine papers in pursuance of a measurement purporting to be in conformity to this rule can be changed or set aside only by the Commissioner of Navigation, so long as the vessel remains unchanged in form or burden. Applications for amendment or revision in such cases must be submitted to the Commissioner of Navigation with a precise statement of the errors supposed to exist.

NEW DOCUMENTS ISSUE FROM READMEASUREMENTS.

ART. 51. (*a*) Upon the application of the owner, any vessel duly measured prior to April 1, 1895, may be remeasured in whole, or in part, to get the benefits of

the deductions authorized under the act of March 2, 1895, and a new register, enrollment, or license issued.

APPENDIX FOR FOREIGN PORTS.

ART. 52. Upon application by the master or owner of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately for use in foreign ports the measurement of such space or spaces as are permitted to be exempted or deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States, and vice versa.

MEASUREMENT OF GOVERNMENT VESSELS.

ART. 53. The tonnage of Government colliers, transports, supply ships, repair ships, etc., shall be ascertained on request in accordance with these rules, but the following requirements will be waived: The marking of the ship's name and home port, official number (none required), and net tonnage; the requirements of size and conditions of crew space, and the certifications of deducted spaces on the beam over the doorway. The plate over the door designating its use is sufficient for such certifications.

FOREIGN VESSELS.

ART. 54. A similar mode of measurement having been adopted by Great Britain, Belgium, Denmark, Italy, Sweden, Norway, Spain, the Netherlands, Russia, Finland, Portugal, Japan, and France, and the like courtesy having been extended to vessels of the United States, it is directed that merchant vessels of those countries, the registers of which indicate their gross and net tonnage under their present laws, shall be taken in the ports of the United States to be of the tonnage so expressed in their documents. Vessels of foreign countries, other than the aforesaid, are to be measured according to the laws of the United States.

MEASURING INSTRUMENTS.

ART. 55. (*a*) The measurements should be made with a waterproof tape, graduated into feet and tenths of a foot, and as nearly inelastic as possible. Chesterman's metallic tape is recommended.

(*b*) Sliding rods which are of three sizes: One 3 feet long for taking depths from 3 to 5.8 feet; another 6 feet long for taking depths from 6 to 11 feet, or, with the extension piece attached, to 16 feet; and a third one 11 feet long for taking depths from 11 to 21 feet, or, with the extension piece attached, to 26 feet. The movable or index rod in each has an arrow index traversing a decimal scale on the fixed rod. Greater depths may be taken by inserting into the ends of the index rods, and extension piece, provided with sockets for this purpose, one or more joints of lift rods described below:

The fixed rod is graduated in feet (in red), and tenths and half-tenths (in black), and when the ends of the rods are well together the arrow on the index rod points to the figure indicating the constant

length of the fixed rod, and, as the index rod is moved up, the arrow indicates the length from the upper end thereof to the lower end of the fixed rod. Bear in mind, however, that when you use any of the attachments referred to above you must add to the reading on the fixed rod the net length of the attachment used; e. g., if the 6-foot rod is extended to its limit, 11 feet, which is reached when the arrow on the index rod is fair with the upper end of the fixed rod, and the extension piece is attached, which is done by slipping the bands on the lower end of it over the upper end of the index rod until the upper edge of the upper band is fair with the upper end of the index rod, and by fastening (on the groove side of the index rod) with set screws in the said bands, the length will not be 11 feet, as shown by the reading, but 16 feet, the reading plus the increment due to the attachment (11 feet + 5 feet). This increment may be further increased by inserting into the end of the extension piece one or more joints of lift rods, each of which is about 3.95 feet when adjusted.

At the station of the area to be measured in single-deck vessels, the rod is to be placed on the ceiling, or floor beam or timber when no ceiling is present, alongside the keelson or line of the keel, perpendicular, or square thereto, and also parallel to the middle longitudinal plane of the ship, and forced up firmly under the deck and fixed in such position by the set screws; from the depth thus found take one-third of the round of beam to get the depth of the area.

The depth of an area taken as above is to be divided into the required number of equal parts. (See art. 11.) With the rod fixed in position as above, set off on it from its lower end one of these equal parts, or common interval between the breadths, using white or other colored chalk or material that will make a visible mark, which gives the position of the first breadth above the bottom breadth, and from this when the rod is taken down the positions of the remaining breadths are to be set off at the said common interval.

The positions of all the breadths being thus severally marked on the rod, it is then to be set up again and firmly fixed or held in position, and the breadths may be readily and correctly measured by means of the tape held at right angles across the rod at each of the positions marked thereon.

In measuring vessels with more than one deck, where the second deck from the bottom is the tonnage deck, it will be necessary to use two of these rods in combination, one directly over the other, one in the hold under the first deck, as directed for single-deck vessels, and the other in the space between this deck and the tonnage deck. In this combination the tonnage depth is found by adding together the two depths and the thickness of the deck between the rods and deducting from this combined depth one-third of the round of beam; then proceed as before directed.

(*c*) A 2-foot rule, with a hinge joint, is required for taking the rake of the bow and stern, and for other purposes. (Figs. 9 and 10.)

(*d*) A carpenter's square will be found useful for setting the sliding rod perpendicular to the keelson.

(*e*) For taking the breadths in the hold which are beyond the reach of the measuring officers two lift rods will be needed, each about 8

feet long (made by joining two sections), one having a pulley at the end over which the tape may be drawn when the rods are held in position and the other an attachment for holding the ring at the end of the tape.

(*f*) For transferring the location of the stations or ordinates of the transverse sections from the deck to the keelson, and sometimes, for finding registered breadth, a plumb line and bob are needed.

(*g*) For measuring laden vessels for Panama or Suez Canal tonnage certificates, as provided for in the regulations, a girting galvanized chain of an approved make is required.

BLANKS.

ART. 56. The following blanks are to be furnished the measuring officers: Memorandum of dimensions, etc. (Cat. 1413); Tonnage admeasurements (Cat. 1410); Record of tonnage admeasurement (Cat. 1411); Certificate of admeasurement (Cat. 1414); Inspector's certificate (Cat. 1322); Notice of assignment of official number and signal letters (Cat. 1321); Master carpenter's certificate (Cats. 1261 and 1261a); and Application of owner for official number (Cat. 1320) The last two blanks to be given the builder and owner for execution.

PLANS AND DRAWINGS FOR MEASURERS.

ART. 57. (*a*) The builder or owner of a steam vessel of over 100 gross tons, approximately, is requested, if practicable, in order to facilitate measurement, to furnish, a reasonable time before the vessel is launched, to the principal customs officer nearest to the place where the vessel is building, the following plans:

(1) A drawing of the cross section in which is shown the construction of the double bottom, if there be one; (2) an inboard view of the longitudinal section, showing the double bottom, its use or uses, if one, otherwise the floors, the compartments for water ballast, other than the double bottom, the decks, the superstructures, hatchways, etc.; (3) deck plans showing the arrangement and uses of different compartments and deductible spaces; (4) drawings showing the arrangement of the engine, boiler, and fuel compartments; and (5) a body plan showing half breadths of the sections at the points of division of the tonnage length of the vessel into a certain number of equal parts in accordance with the rules for the measurement of spaces under the tonnage deck. The scale or scales of these drawings are to be indicated thereon.

(*b*) The collector of customs is to be advised of any subsequent changes in the vessel and furnished copies of the corrected plans, or a statement of such changes.

(*c*) Builders or owners of smaller vessels will notify the principal customs officer nearest to the place where the vessel is building when the hold may be measured before cabins or other compartments are built in or the machinery installed. The measurers should be allowed access to such plans as will aid their work.

TABLES.

For finding the decimal equivalent of inches, and for converting tons into cubic meters, and vice versa, the following tables will be found useful:

Decimal Equivalent of Inches.

One foot, or 12 inches, the integer.			
Inches.	Equivalents in decimals of a foot.	Inches.	Equivalents in decimals of a foot.
11	0.92	4	0.33
10	.83	3	.25
9	.75	2	.17
8	.67	1	.08
7	.58	¾	.06
6	.50	½	.04
5	.42	¼	.02

Reduction of Tons to Cubic Meters.

Tons.	Meters.	Tons.	Meters.	Tons.	Meters.	Tons.	Meters.
1	2.83	26	73.58	51	144.33	76	215.08
2	5.66	27	76.41	52	147.16	77	217.91
3	8.49	28	79.24	53	149.99	78	220.74
4	11.32	29	82.07	54	152.82	79	223.57
5	14.15	30	84.90	55	155.65	80	226.40
6	16.98	31	87.73	56	158.48	81	229.23
7	19.81	32	90.56	57	161.31	82	232.06
8	22.64	33	99.39	58	164.14	83	234.89
9	25.47	34	96.22	59	166.97	84	237.72
10	28.30	35	99.05	60	169.80	85	240.55
11	31.13	36	101.88	61	172.63	86	243.38
12	33.96	37	104.71	62	175.46	87	246.21
13	36.79	38	107.54	63	178.29	88	249.04
14	39.62	39	110.37	64	181.12	89	251.87
15	42.45	40	113.20	65	183.95	90	254.70
16	45.28	41	116.03	66	186.78	91	257.53
17	48.11	42	118.86	67	189.61	92	260.36
18	50.94	43	121.69	68	192.44	93	263.19
19	53.77	44	124.52	69	195.27	94	266.02
20	56.60	45	127.35	70	198.10	95	268.85
21	59.43	46	130.18	71	200.93	96	271.68
22	62.26	47	133.01	72	203.76	97	274.51
23	65.09	48	135.84	73	206.59	98	277.34
24	67.92	49	138.67	74	209.42	99	280.17
25	70.75	50	141.50	75	212.25	100	283.00

To reduce cubic meters to tons divide the number of cubic meters in question by 2.83, or multiply it by the factor 0.353.

DEFINITION OF INCLOSURES ABOVE DECK.

Forecastle.—An erection upon the upper deck of a vessel, extending from side to side from the stem toward aft.

Bridge.—A decked erection usually from 6 to 8 feet in height and of undefined length, fitted about amidships and extending from side to side over the upper deck of a vessel.

Break.—A break is the space above the line of the under side of the upper deck when that deck is cut off and continued at a higher elevation. The height of a break is the distance from the said line to the under side of the break deck. The break in the deck is caused usually by a sunk forecastle, a sunk poop, or raised quarter-deck, etc.

Poop.—A structure on the extreme after end of a weather deck extending from side to side of a vessel.

Roundhouse.—An erection from 6 to 8 feet in height on or above the upper deck but not extending from side to side of the vessel, as is the case with a bridge, a forecastle, a poop, or raised quarter-deck. For descriptive purposes on vessel documents, spaces not extending from side to side of the vessel, of less height, such as cabin heads or trunks, and closed-in spaces over the holds of motor boats, etc., may be classed as roundhouses.

Side house.—A small house at the side of the upper, forecastle, bridge, or poop deck, etc., of a vessel.

Chart house.—A small structure of iron, steel, or wood, about 7 feet in height on a bridge or weather deck of a steamer; where the charts are kept, and where the master usually stays when not on duty, while navigating in narrow waters.

Radio house.—A structure on the weather deck of a vessel or on a superstructure thereon, in which is installed the wireless apparatus and in which is provided accommodation for the operator when on or off duty.

Excess hatchways.—The difference between the total of the spaces within the hatchways of a vessel and one-half of 1 per cent of her gross tonnage exclusive of hatchways.

Light and air spaces.—The portion of the spaces within the casings around the boiler and engine hatches and above the upper deck to the hull of a steamer for machinery or for admission of light and air to her boilers or machinery below.

DEFINITION OF THE ITEMS OF DEDUCTION.

Crew spaces.—The space appropriated exclusively to the use of the crew of a vessel, which includes every person whose name is entered on her muster roll or articles, except such spaces as the engineer shop, carpenter shop, plumber shop, butcher shop, etc., wherever situated, and the dynamo room below deck. The total of all crew-space deductions will be shown on vessel documents under the head of "crew space."

Master's cabin.—A space for the exclusive use of the master, and consists of his sleeping room, bathroom, dressing room, office, and passageways, serving his accommodations. But the room in the same apartment with these generally used as a dining saloon for himself and officers will not be considered deductible as a part of the master's cabin, but as a part of the "crew space."

Steering gear.—The space below deck occupied by machinery, fittings, etc., for working the helm of a vessel.

Anchor gear.—The space below deck occupied by chains or cables, machinery, etc., for handling the anchor.

Boatswain's stores.—The spaces for storing paints, oils, blocks, hawsers, rigging, deck gear, etc., in charge of the boatswain and for daily use on the vessel.

Chart house.—See same above.

Donkey engine and boiler.—The space below deck occupied by an auxiliary engine in connection with the main pumps of a vessel, or in connection with her main machinery.

Radio house.—See same above.

Storage of sails.—The space in a vessel propelled wholly by sails used exclusively for storing the same, subject to the limitation of 2½ per cent of the vessel's gross tonnage.

Propelling power.—The deduction for machinery and fuel spaces in powered vessels, such as those propelled by steam, gas, etc.

DEFINITION OF STRUCTURAL TERMS, ETC.

Stem.—In the case of wooden vessels, it is the heavy curved piece of timber which terminates the fore end of a ship's hull. Its lower end is connected to the fore end of the keel, its upper end extending up to (and usually forming a bed for) the bowsprit. In iron or steel vessels it is the heavy piece of iron or steel extending in one length from the keel to above the upper (or forecastle) deck, and forming the extreme fore end of a ship.

Sternpost (main).—In wooden vessels, the piece of timber extending from the after end of the keel to the uppermost deck, and to which the rudder braces are fixed to receive the pintles by which the rudder is hung. In iron or steel sailing vessels, paddle and twin-screw steamers, the heavy forging or casting of iron or steel extending from the after end of the keel (to which it is scarfed) to the upper or poop deck; in single-screw steamers, the after part of the stern frame.

Rudderpost.—See "Sternpost."

Length over all.—The length of the hull of a vessel from the forward part of the stem to the aftermost point of the stern, whether above or below the water line.

Beam.—See "Breadth of beam," article 5. Also a strong piece of timber, heavy angle bar, or a combination of angle bars, bulb bars, etc., spanning the hull of a vessel or a superstructure from side to side.

Molded breadth.—Breadth from outside to outside of frames at the widest part of a vessel, i. e., exclusive of the outside plating or planking.

Ceiling.—Planking covering the inside of a vessel's frames.

Keelson.—In wooden vessels the keelson is composed (like the keel) of various pieces of timber connected endwise and placed on the floors just over the keel and extending all fore and aft. In iron or steel ships the middle-line keelson is the principal keelson at the center line, right over the keel.

Keel.—The so-called backbone of a vessel. In wooden and composite vessels it is composed of pieces of timber of as great length as can be obtained, which are connected to each other by scarfs. In iron or steel vessels it consists generally of long bars, connected by vertical scarfs, or of plates fitted horizontally at the middle line under the floors and connected to each other by butt straps.

Sheer.—The curve formed by the line of a vessel's upper deck at the sides, i. e., the fore-and-aft curvature of the deck.

Stern or horn timber.—The aftermost upper frame of a vessel at the stern.

Stern.—The after end of a vessel.

Rake of the bow.—The inclination of the line of the inner face of the stem from the perpendicular erected at the forward end of the keel.

Rake of the stern timber.—Its (stern timber) inclination from the perpendicular at the after end of the keel.

Round of beam.—See article 10 (*b*).

Deck hook.—A wooden hook in the range of deck beams on which the extreme fore ends of deck planks rest and to which they are fastened. In iron or steel vessels, a hook connecting the extreme fore ends of deck stringer plates.

Bow.—Fore end of a vessel.

Break in double bottom.—The point where the line of the inner bottom is broken and carried on at a higher elevation.

Double bottom.—The space at the bottom of a ship between the inner and outer bottoms, used for storage of water ballast, feed water, fuel oil, etc.

Floor or floor timber.—The lowermost of the various pieces of timber of which a body frame of a vessel is constructed, and which lies across the keel. In an iron or steel vessel a plate placed vertically in the bottom, extending from bilge to bilge, usually in way of each frame, to which it (the frame) is connected. In double bottoms of the usual construction it extends from the outer to the inner bottom thereof.

Limber strake.—The strake of the bottom ceiling next to the keelson.

Limbers or water course.—In wooden vessels, gutters or channels upon the floors, one on each side of the keelson;

Also the holes cut in the under part of the floors;

In composite, iron, and steel ships the various ranges of apertures in the lower portion of the floors;

All serving to allow a passage toward the pumps for water accumulating between the floors.

Batten.—A board or iron bar several inches in breadth, sometimes used in holds of vessels instead of ceiling.

Frame.—One of the numerous transversal ribs that form the skeleton of a vessel.

Web frame.—Web frames consist of strong plates fitted transversally to the frames to which they are riveted. They are placed at intervals, say, one to every fifth, eighth, tenth, or twelfth frame, as the case may be, having their inner edge strengthened (usually) by double reversed angle bars and extend from one deck to another or from a deck or hold beams down to the bilge.

Shell plating.—The plating forming the outer skin of the hull.

Molded depth.—The depth measured amidships from the top of the keel to the top of the upper-deck beam, less the round of beam. In shelter and awning decked vessels it is the depth so measured to the deck next below the shelter or awning deck.

Spar deck.—The upper deck in a spar-deck ship.

Spar-deck ship.—Spar-deck ships have three or more decks, the upper being lighter in construction than the others.

Between decks.—Between decks is the space between any two decks. For measurement purposes it is the space between the second and third, and third and fourth decks, etc., the decks being numbered from below.

Hatchway.—A square aperture in a ship's deck through which cargo is laden or discharged, engines and boilers shipped and unshipped, etc.; in common practice the term "hatch" is also applied.

Cabin.—An apartment usually containing smaller rooms in the sides furnished for dwelling in by the master and officers; and in large ships also affording sleeping accommodation for passengers.

Stateroom.—A place for lodging in a ship's cabin; a passenger's room.

Stiffener.—An angle bar, T-bar, channel bar, etc., used to stiffen plating of the bulkhead, etc.

Bulkhead.—Bulkheads are partitions by which compartments, rooms, etc., in a vessel are formed, or the hold of a ship divided.

Freeing port.—An opening in the bulwark, or shell plating between the shelter and upper decks, for discharging large quantities of water when thrown by the sea upon the ship's deck.

Scupper.—A round or oval aperture serving to lead off small quantities of water, preventing its accumulation on a vessel's deck.

Shaft trunk.—A water-tight structure from about 4 to 7 feet in height, and somewhat less in breadth, according to the size of the vessel, fitted at the middle line upon the floors in small and middle size steamers, but elevated upon supports from 3 to 8 feet above the floors in very large ships; extending from the engine room after bulkhead to the stuffing-box bulkhead. It incloses the screw shafting, to which access is obtained through a water-tight door in the engine-room bulkhead.

RÉSUMÉ OF EXEMPTIBLE SPACES.

Fore peak for water ballast.
Aft peak for water ballast.
Open forecastle.
Open bridge.
Open poop.
Anchor gear.
Steering gear.
Donkey engine and boiler.
Light and air when not requested to be added to machinery space below deck.
Wheelhouse.
Galley.
Condenser.
Water-closets.
Domes.
Skylights.
Companions, except portions used for smoking rooms.
Cabins for passengers, when on decks not to the hull, such as shelter, forecastle, bridge, and poop decks.

These spaces to be exempt, except the fore peak and aft peak, must be on or above the upper deck to the hull.

INDEX TO PART I.—MEASUREMENT OF AMERICAN VESSELS.

	Page.
Additional allowance for floors of vessels more than 59 feet in breadth	19
Aft breadth of round poops, etc	21
Anchor gear, space for	28,39
Appendix to register of vessels in foreign trade	35
Areas, first and last (see footnote)	20
Areas, numbering of	19
Beam, round of	14
Between decks	20
Blanks, etc	37
Boatswain's stores:	
Certification of	28
Definition of	39
Restrictions on	28
Spaces treated as	28
Body plan	37
Bottom breadths	16
Breadth, register	7,10
Breadths of cross sections, numbering of	16
Break, poop, etc., on upper deck	21,38,39
Breaks in double bottom, measurement of vessels with	13,14
Bulk-oil carriers, depths of	19
Cabins and staterooms, when not measured	11,21,24
Calculations	33
Capacity under tonnage deck	11,19
Capstan, space for	28
Cargo and store spaces, wherever located, measured	11
Carpenter's square, use of	36
Chain locker, how classed	28
Change of tonnage	34
Changes in vessel's plans	37
Charts, space for	28
Classes of tonnage length	13
Clerk's office not deductible	25
"Closed-in" spaces on the upper deck, when exempted	22
Companion, when exempt	22
Crew space	25
Fishing boats, etc	26
Mississippi River steamers	27
Penalty for obstructing	26
Requirements of	26
Cross section:	
Divisions of depths	15
Drawing of	37
Decision of Commissioner final	7
Deck beam (aftermost)	12
Deck-beam shelves, no allowance for, in finding upper breadths	15
Deck houses	21,22
Deck opening	23
Deck plans	37
Deck to the hull	24
Deducted spaces	25
Engine room	29,33
How to measure	25
Marking of	26
Depth of double bottoms	18–19
Depth of transverse section of vessel insulated in the hold	15
Depth of transverse sections of vessels with raised platforms in the bottom	15
Depth of vessels with breaks in double bottom	14
Depth, register	11,14
Description of vessel in marine documents	7
Diagram of areas	34
Domes for ventilation	22
Donkey engine, etc	28
Double bottom, breaks in	13
Double bottom for other than ballast	18
Double bottom, how to measure	19
Doubts concerning measurements, submit to Commissioner of Navigation	25
Drawings, forward to principal customs officer	37
Dredgers	33
Engine, boiler, and fuel compartments, plan of	37
Engine space, always measure	31
Engine space in house on motor boat	25
Engine space in motor boat, space included in	32
Engine space in motor boat, space not included in	32
Excess hatchways	20,39
Excluded spaces, record of	24
Exempted closed-in spaces on the upper deck	22
Exemptible spaces, résumé of	42
Exemption of shelter deck	23
Extended double bottoms, breadths in vessels with	17

	Page.
False ceiling, breadth of transverse sections of vessels with	15
Foreign-built ships admitted to American register	7
Foreign vessels	35
Fractions of a foot expressed in decimals	7
Freeing ports	23
Fumigation	27
Gross register tonnage	20
Gross tonnage, items of	11
Gross tonnage, when to ascertain	11
Hatchways, cubical contents of	20
Hatchways, excess of	20, 39
Height of spar deck	7
Helm, space for working	28
Horizontal double bottoms, measurement of vessels with	18
Hospital spaces	26
Inboard view or plan	37
Inches, decimal equivalent of	38
Inclosures above deck, definition of	38
Break	83
Bridge	38
Chart house	39
Excess hatchways	39
Forecastle	38
Light and air spaces	39
Poop	39
Radio house	39
Roundhouse	39
Side house	39
Insulation in hold of refrigerator ship	15
Intervals and one-third intervals of breadth and length	16
Items of deduction, definition of	39
Anchor gear	39
Boatswain's stores	39
Chart house	39
Crew space	39
Donkey engine and boiler	39
Master's cabin	39
Propelling power	40
Radio house	40
Steering gear	39
Storage of sails	40
Items of gross tonnage	11
Ladderway from shaft trunk, treatment of	31
Length, register	10
Lift rods, use of	36
Light and air space	29
Light and air space, rule for finding the amount to add	30
Machinery space	31
Main sternpost	10, 40
Marine document	7
Marking and recording of tonnage	33
Marking fixed points	13
Master's accommodation	27
Measurement of Government vessels	35
Measurement of vessels with nonhorizontal double bottoms	17
Measurements to be taken in feet and fractions of feet	7
Measuring instruments	35
Midship section, position of, on the keelson	14
Motor boats, light and air or machinery space above deck	25
Navigation spaces	28
Net tonnage	33
Net tonnage, where and how marked	33
Officials authorized to measure vessels	7
Open spaces, definition and treatment of	23
Open vessels, measurement of	25
Openings required for exemption, etc	23
Owner's application for exemptions	23
Paint and oil room, classification of	28
Passengers in open spaces	24
Passengers on Army and Navy transports	24
Paymaster's office	25
Permanent openings	23
Plans, drawings, etc	37
Plans of small vessels	37
Poop, length of	21
Propelling-power allowance	29
Purser's office not deductible	25
Raised platform in bottom of vessel	15
Rake of stem in thickness of deck, how to find	12
Rake of stern timber in thickness of deck and one-third round of beam, how to find	12
Refrigerator ship, insulation in hold of	15
Register breadth	7, 10

	Page.
Register depth	11, 14
Register depth of bulk-oil carriers	19
Register length	10
Register ton, unit of	11, 33
Round of beam	14
Scale of drawings	37
Scantlings for ceiling on double bottom, no allowance for thickness of	17
Scows and barges, register length of	10
Shaft trunks	32, 42
Shelter deck	23
Shelter for deck passengers	24
Side ballast tanks	16
Signal lamps, space for, classification of	28
Skylights for ventilation	22
Sliding rods, how to use	35
Space deducted, in gross tonnage	33
Spaces on or above the upper deck	21–22
Steam vessels, when to measure	11
Steering gear	28, 39
Sternpost, main	10, 40
Storage of sails	28, 40
Structural terms, definition of	40
Batten	41
Beam	40
Between decks	41
Bow	41
Break in double bottom	41
Bulkhead	42
Cabin	42
Ceiling	40
Deck hook	41
Double bottom	41
Floor, or floor timber	41
Frame	41
Freeing port	42
Hatchway	41
Keel	40
Keelson	40
Length over all	40
Limber strake	41
Limbers or water course	41
Molded depth	41
Rake of the bow	40
Rake of the stern timber	41
Rudderpost	40
Scupper	42
Shaft trunk	42
Sheer	40
Shell plating	41
Spar deck	41
Spar-deck ship	41
Stateroom	42
Stem	40
Stern	40
Stern timber	40
Sternpost, main	40
Stiffener	42
Web frame	41
Tape line	35
Temporary closures of tonnage openings	23
Terminal points of tonnage deck	12
Tons to cubic meters	38
Tonnage and registered depths of vessels with breaks in double bottom	14
Tonnage deck	7
Tonnage depth of bulk-oil carriers	19
Tonnage length	11
Tonnage length, classes of	13
Tonnage mark, size of	34
Tonnage measurement, purpose of	11
Tonnage, unit of	11, 33
Transfer of sections to keelson	14
Transverse areas in vessels with extended double bottom	16, 17
Transverse areas, rule for finding	15, 16
Two-foot rule, uses of	36
Unit of tonnage	11, 33
Upper breadth of transverse section, where to take	15, 16
Upper deck openings	23
Upper deck to the hull	24
Vessels, classes of	13
Vessels exempt from measurement	7
Vessels requiring measurement	7
Waivers for naval vessels	35
Washrooms for crew	27
Water ballast	16, 17, 18
Wood covers for tonnage opening	23

Part II.—LAWS OF THE UNITED STATES RELATING TO THE MEASUREMENT OF VESSELS.

The Commissioner of Navigation shall be charged with the supervision of the laws relating to the admeasurement of vessels, and the assigning of signal letters thereto, and of designating their official number; and on all questions of interpretation growing out of the execution of the laws relating to these subjects, and relating to the collection of tonnage tax, and to the refund of such tax when collected erroneously or illegally, his decision shall be final July 5, 1884. Sec. 3.

MEASUREMENT.

Before any vessel shall be registered, she shall be measured by a surveyor, if there be one, or by the person he shall appoint, at the port or place where the vessel may be, and if there be none, by such person as the collector of the district within which she may be shall appoint. But in all cases where a vessel has before been registered as a vessel of the United States, it shall not be necessary to measure her anew, for the purpose of obtaining another register; unless such vessel has undergone some alteration as to her burden, subsequent to the time of her former registry. R. S., 4148.

The officer or person by whom such measurement is made shall, for the information of and as a voucher to the officer by whom the registry is to be made, grant a certificate, specifying the build of the vessel, her number of decks and masts, her length, breadth, depth, the number of tons she measures, and such other particulars as are usually descriptive of the identity of a vessel, and that her name, and the place to which she belongs, are painted on her stern in manner required by this Title [R. S., 4131–4305]; which certificate shall be countersigned by an owner, or by the master of such vessel, or by some other person who shall attend her admeasurement, on behalf of her owner or owners, in testimony of the truth of the particulars therein contained; without which the certificate shall not be valid. R. S., 4149.

The registry of every vessel shall express her length and breadth, together with her depth and the height under the third or spar deck, which shall be ascertained in the following manner: The tonnage deck, in vessels having three or more decks to the hull, shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage-deck. The length from the fore part of the outer planking on the side of the stem to the after part of the main stern-post of screw-steamers, and to the R. S., 4150.

after part of the rudder-post of all other vessels measured on the top of the tonnage-deck, shall be accounted the vessel's length. The breadth of the broadest part on the outside of the vessel shall be accounted the vessel's breadth of beam. A measure from the under side of the tonnage-deck plank, amidships, to the ceiling of the hold, (average thickness,) shall be accounted the depth of hold. If the vessel has a third deck, then the height from the top of the tonnage-deck plank to the under side of the upper-deck plank shall be accounted as the height under the spar-deck. All measurement to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

R. S., 4151. No part of any vessel shall be required by the preceding section to be measured or registered for tonnage that is used for cabins or state-rooms, and constructed entirely above the first deck, which is not a deck to the hull.

GROSS TONNAGE.

R. S., 4153. The register tonnage of every vessel built within the United States or owned by a citizen or citizens thereof shall be her entire internal cubical capacity in tons of one hundred cubic feet each, to be ascertained as follows: Measure the length of the vessel in a straight line along the upper side of the tonnage-deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern-timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern-timber in the thickness of the deck, and also what is due to the rake of the stern-timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the vessel belongs:

Class one. Vessels of which the tonnage length according to the above measurement is fifty feet or under: into six equal parts.

Class two. Vessels of which the tonnage length according to the above measurement is above fifty feet and not exceeding one hundred feet: into eight equal parts.

Class three. Vessels of which the tonnage length according to the above measurement is above one hundred feet, and not exceeding one hundred and fifty feet: into ten equal parts.

Class four. Vessels of which the tonnage length according to the above measurement is above one hundred and fifty feet, and not exceeding two hundred feet: into twelve equal parts.

Class five. Vessels of which the tonnage length according to the above measurement is above two hundred feet, and not exceeding two hundred and fifty feet: into fourteen equal parts.

Class six. Vessels of which the tonnage length according to the above measurement is above two hundred and fifty feet: into sixteen equal parts.

Then, the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor-timber, at the inside of the limber-strake, after deducting the average thickness of the ceiling, which is between the bilge-planks and limber-strake; then, if the depth at the midship division of the length do not exceed sixteen feet, divide each depth into four equal parts; then measure the inside horizontal breadth, at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breath one, and so on down to the lowest breadth; multiply the second and fourth by four, and the third by two; add these products together, and to the sum add the first breadth and the last, or fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed sixteen feet, divide each depth into six equal parts, instead of four, and measure as before directed, the horizontal breadths at the five points of division, and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by four, and the third and fifth by two; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively one, two, three, and so forth, number one being at the extreme limit of the length at the bow, and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into six or sixteen parts, as in classes one and six, or any intermediate number, as in classes two, three, four, and five, multiply the second, and every even-numbered area by four, and the third, and every odd-numbered area, except the first and last, by two; add these products together, and to the sum add the

first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage-deck; divide this product by one hundred, and the quotient, being the tonnage under the tonnage-deck, shall be deemed to be the register tonnage of the vessel subject to the additions hereinafter mentioned.

DECK HOUSES, BREAKS, ETC.

R. S., 4153. Mar. 2, 1895. Sec. 1 (h).

If there be a break, a poop, or any other permanent closed-in space on the upper deck, available for cargo, or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained as follows and added to the gross tonnage:

Measure the internal mean length of such space in feet, and divide it into an even number of equal parts of which the distance asunder shall be most nearly equal to those into which the length of the tonnage-deck has been divided; measure at the middle of its height the inside breadths; namely, one at each end and at each of the points of division, numbering them successively one, two, three, and so forth; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks, and multiply by it the mean horizontal area; divide the product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage-decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

HATCHWAYS.

Feb. 6, 1909.

The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of beam to the under side of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of one per cent of the gross tonnage and the remainder only shall be added to the gross tonnage of the ship exclusive of the tonnage of the hatchways.

BETWEEN DECKS.

R. S., 4153.

If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage-deck shall be ascertained as follows:

Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage-deck is divided; measure, also at the middle of its height, the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively one, two, three, and so forth, commencing at the stem; multiply the second, and all other even-numbered breadths, by four, and the third, and all the other odd-numbered breadths, except the first and last, by two; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two decks, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel ascertained as above directed. And if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage-deck, shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as above directed.

OPEN VESSELS.

In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary-line of measurement, and the depth shall be taken from an athwartship line, extending from the upper edge of such strake at each division of the length. R. S., 4153.

WATER BALLAST.

In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall for the purposes of measurement be deemed to represent the floor timber. From the gross tonnage there shall be deducted any other space adapted only for water ballast certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel. Mar. 2, 1895. Feb. 6, 1909. Sec. 2.

NET TONNAGE.

From the gross tonnage of every vessel of the United States there shall be deducted— Aug. 5, 1882.

CREW ACCOMMODATIONS.

Mar. 2, 1895.

(a) The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. Every place appropriated to the crew of the vessel shall have a space of not less than seventy-two cubic feet and not less than twelve superficial feet, measured on the deck or floor of that place, for each seaman or apprentice lodged therein. The provisions of this Act requiring a crew space of seventy-two cubic feet per man shall apply only to vessels the construction of which shall be begun after June thirtieth, eighteen hundred and ninety-five. Such place shall be securely constructed, properly lighted, drained, and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from the effluvium of cargo or bilge water; and failure to comply with this provision shall subject the owner to a penalty of five hundred dollars. Every place so occupied shall be kept free from goods or stores of any kind not being the personal property of the crew in use during the voyage; and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged in that place the sum of fifty cents a day for each day during which any goods or stores as aforesaid are kept or stored in the place after complaint has been made to him by any two or more of the seamen so lodged. No deduction from tonnage as aforesaid shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate with these words, "certified to accommodate —— seamen."

Mar. 4, 1915. Sec. 6.

That on all merchant vessels of the United States the construction of which shall be begun after the passage of this Act, except yachts, pilot boats, or vessels of less than one hundred tons register, every place appropriated to the crew of the vessel shall have a space of not less than one hundred and twenty cubic feet and not less than sixteen square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

That in addition to the space allotment for lodgings hereinbefore provided, on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of twelve or more seamen,

there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every twelve seamen, constituting her crew, provided that not more than six bunks shall be required in any case.

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew, which shall conform to the requirements of this section, so far as they are applicable thereto, by providing sleeping room in the engine room of such steamboat, properly protected from the cold, wind, and rain by means of suitable awnings or screens on either side of the guards or sides and forward, reaching from the boiler deck to the lower or main deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

All merchant vessels of the United States, the construction of which shall be begun after the passage of this act having more than ten men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed ten, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of wash basins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than $50 nor more than $500: *Provided*, That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

DEDUCTIONS FOR OTHER PURPOSES.

(b) Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space. Mar. 2, 1895.

(c) Any space used exclusively for the working of the helm, the capstan, and the anchor gear, or for keeping the charts, signals, and other instruments of navigation and boatswain's stores, and the words "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

(d) The space occupied by the donkey engine and boiler, if connected with the main pumps of the ship.

(e) In the case of a ship propelled wholly by sails any space, not exceeding two and one-half per centum of the gross tonnage, used exclusively for storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent and properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

DEDUCTIONS FOR PROPELLING POWER.

Mar. 2, 1895.

(f) In the case of a ship propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made, as follows:

In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above twenty per centum and under thirty per centum of the gross tonnage, the deduction shall be thirty-seven per centum of the gross tonnage; and in ships propelled by screws in which the tonnage of the space is above thirteen per centum and under twenty per centum of the gross tonnage, the deduction shall be thirty-two per centum of the gross tonnage. In the case of screw steamers the contents of the trunk shaft shall be deemed spaces necessary for the proper working of the machinery.

(g) In the case of other vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to twenty per centum or under and in the case of screw vessels to thirteen per centum or under of the gross tonnage of the ship, the deduction shall consist in the case of paddle vessels of once and a half the tonnage of the actual machinery space and in the case of screw vessels of once and three-fourths the tonnage of the actual machinery space. But if the actual machinery space is so large as to amount in the case of paddle vessels to thirty per centum or above, and in the case of screw vessels to twenty per centum or above of the gross tonnage of the ship, the deduction shall consist of thirty-seven per centum of the gross tonnage of the ship in the case of a paddle vessel and thirty-two per centum of the gross tonnage in the case of a screw vessel; or if the owner prefers there shall be deducted from the gross tonnage of the vessel the tonnage of the space or spaces actually occupied by or required to be inclosed for the proper working of the boilers and machinery, including the trunk shaft or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of fifty per centum, and in the case of vessels propelled by screws of seventy-five per centum of the tonnage of such space.

(i) On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such

portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage; such space or spaces must be reasonable in extent, safe, and seaworthy, and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the ship.

REGISTER TONNAGE.

And the proper deduction from the gross tonnage having been made, the remainder shall be deemed the net or register tonnage of such vessels. Aug. 5, 1882.

The register of the vessel shall express the number of decks, the tonnage under the tonnage-deck, that of the between-decks, above the tonnage-deck; also that of the poop or other inclosed spaces above the deck, each separately. R. S., 4153.

The register or other official certificate of the tonnage or nationality of a vessel of the United States, in addition to what is now required by law to be expressed therein, shall state separately the deductions made from the gross tonnage, and shall also state the net or register tonnage of the vessel. Aug. 5, 1882.

But the outstanding registers or enrollments of vessels of the United States shall not be rendered void by the addition of such new statement of her tonnage, unless voluntarily surrendered; but the same may be added to the outstanding document or by an appendix thereto, with a certificate of a collector of customs that the original estimate of tonnage is amended.

In every vessel documented as a vessel of the United States the number denoting her net tonnage shall be deeply carved or otherwise permanently marked on her main beam, and shall be so continued; and if the number at any time cease to be continued such vessel shall be subject to a fine of thirty dollars on every arrival in a port of the United States if she have not her tonnage number legally carved or permanently marked. R. S., 4153. June 19, 1886. Sec. 5.

Under the direction of the Secretary of Commerce the Commissioner of Navigation shall make regulations needful to give effect to the provisions of this Act. The Secretary of Commerce shall establish and promulgate a proper scale of fees to be paid for the readmeasurement of the spaces to be deducted from the gross tonnage of a vessel, on the basis of the last sentence of section forty-one hundred and eighty-six of the Revised Statutes, beginning with the words "But the charge for the measurement." Mar. 2, 1895. Sec. 4. Feb. 14, 1903. Sec. 10. Aug. 5, 1882. Sec. 3.

APPENDIX OF MEASUREMENT.

Mar. 2, 1895. Feb. 14, 1903. Sec. 10.

Upon application by the owner or master of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately, for use in foreign ports, the measurement of such space or spaces as are permitted to be deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States.

Mar. 2, 1895. Sec. 2.

This Act shall not be construed to require the remeasurement of any American vessel duly measured before April first, eighteen hundred and ninety-five; but upon application by the owner of any such vessel collectors of customs shall cause such vessel, or the spaces to be deducted, to be measured according to the provisions of this Act, and if a new register is not issued the statement of such remeasurement shall be attached by an appendix to the outstanding register or enrollment with a certificate of the collector of customs that the original estimate of tonnage is amended pursuant to this Act.

VESSELS EXEMPT FROM MEASUREMENT.

R. S., 4152.

The provisions foregoing relating to the measurement of vessels shall not be deemed to apply to any vessel not required by law to be registered, or enrolled, or licensed, unless otherwise specially provided.

MEASUREMENT OF FOREIGN VESSELS.

R. S., 4154. Aug. 5, 1882. Sec. 2. Feb. 14, 1903. Sec. 10.

Whenever it is made to appear to the Secretary of Commerce that the rules concerning the measurement for tonnage of vessels of the United States have been substantially adopted by the government of any foreign country, he may direct that the vessels of such foreign country be deemed to be of the tonnage denoted in their certificates of register or other national papers, and thereupon it shall not be necessary for such vessels to be remeasured at any port in the United States; and when it shall be necessary to ascertain the tonnage of any vessel not a vessel of the United States, the said tonnage shall be ascertained in the manner provided by law for the measurement of vessels of the United States.

EXEMPTION FROM MEASUREMENT.

Aug. 18, 1914. Sec. 2.

The President of the United States is hereby authorized, whenever in his discretion the needs of foreign commerce may require, to suspend by order,[1] so far and for such length of time as he may deem desirable, the provisions of law prescribing that all the watch officers of vessels of the United States registered for foreign trade shall be citizens of the United States.

---

[1] Under this authority the following Executive orders have been issued:

Under like conditions, in like manner, and to like extent the President of the United States is also hereby authorized to suspend the provisions of the law requiring survey, inspection, and measurement by officers of the United States of foreign-built vessels admitted to American registry under this act.

EXECUTIVE ORDER OF SEPTEMBER 4, 1914.

1. The provisions of law prescribing that the watch officers of vessels of the United States registered for foreign trade shall be citizens of the United States are hereby suspended so far and for such length of time as is herein provided, namely: All foreign-built ships which shall be admitted to United States registry under said act may retain the watch officers employed thereon, without regard to citizenship, for seven years from this date, and such watch officers shall be eligible for promotion. Any vacancy occurring among such watch officers within two years from this date may be filled without regard to citizenship; but any vacancy which may occur thereafter shall be filled by a watch officer who is a citizen of the United States.

2. The provisions of law requiring survey, inspection, and measurement, by officers of the United States, of foreign-built ships admitted to United States registry under said act, are hereby suspended for two years from this date.

EXECUTIVE ORDER OF SEPTEMBER 1, 1916.

1. The provisions of the law prescribing that the watch officers of vessels of the United States registered for foreign trade shall be citizens of the United States are hereby suspended so far and for such length of time as is herein provided, namely: All watch officers now employed on foreign-built ships which have been admitted to United States registry under said act who, heretofore, have declared their intention to become citizens of the United States and watch officers on such ships who, within six months from this date, shall declare their intention to become such citizens shall be entitled to serve on foreign-built ships so registered until the time shall have expired within which they may become such citizens under their declarations, and shall be eligible for promotion upon any foreign-built ship so registered.

2. The provisions of law requiring survey, inspection, and measurement, by officers of the United States, of foreign-built ships admitted to United States registry under said act are hereby suspended so far and for such length of time as is herein provided, namely: The said provisions shall not apply to any such foreign-built ship during the period of one year from this date provided the Secretary of Commerce is satisfied in the case of any such ship that the ship is safe and seaworthy and that proper effort is being made to comply with the said provisions.

EXECUTIVE ORDER OF SEPTEMBER 7, 1917.

In pursuance of the authority conferred upon the President of the United States by section 2 of the act approved August 18, 1914, entitled "An act to provide for the admission of foreign-built ships to American registry for the foreign trade, and for other purposes," it is hereby ordered:

That the provisions of law requiring survey, inspection, and measurement, by officers of the United States, of foreign-built ships admitted to United States registry under said act are hereby suspended so far and for such length of time as is herein provided, namely: The said provisions shall not apply to any such foreign-built ship during the period of two years from September 1, 1917, provided the Secretary of Commerce is satisfied in the case of any such ship that the ship is safe and seaworthy and that proper effort is being made to comply with the said provision.

INDEX TO PART II.—NAVIGATION LAWS RELATING TO MEASUREMENT OF AMERICAN VESSELS.

	Page.
Appendix of measurement	56
Between decks	50, 51
Breaks, poops, or inclosed spaces on upper deck, rule for finding contents of	50
Cabins and staterooms, when exempted	48
Crew spaces	52
Crew spaces of fishing vessels, pilot boats, etc.	52
Crew spaces of Mississippi River steamers	53
Crew spaces, penalty for obstructing	52
Decision of Commissioner final	47
Description of vessels in register	47
Double bottom for water ballast, etc	51
Donkey engine, etc	53
Hatchways	50
Hospital spaces	53
Light and air	54, 55
Master's accommodations	53
Measurement of foreign vessels	56
Marking of tonnage	55
Navigation spaces	53
Net tonnage	55
Officials authorized to measure vessels	47
Open vessels	51
Outstanding registers or enrollments	55
Propelling power allowance	54
Regulations for enforcement of measurement laws	55
Register tonnage	48, 55
Remeasurement of vessels	47
Storage of sails	54
Tonnage classes	48
Tonnage, gross, how obtained	48–51
Transverse area	49
Vessels, by whom measured	47
Vessels exempt from measurement	56
Vessels requiring measurement	47
Washing place for crew	53
Water ballast	51

Part III.—PANAMA CANAL MEASUREMENT.

1. Customs officers authorized to measure vessels at ports of the United States are authorized by Article XVI of the proclamation of the President of the United States of November 21, 1913, "Rules for the measurement of vessels for the Panama Canal," to measure vessels according to Panama Canal rules for measurement and to issue Panama Canal tonnage certificates.

2. Customs officers may obtain Panama Canal rules for measurement and a supply of Panama Canal tonnage certificates from the "Chief of Office, the Panama Canal, Washington, D. C."

3. Questions of interpretation under Panama Canal measurement rules will be submitted in writing directly to the governor of the Panama Canal, Balboa Heights, Canal Zone. Decisions on such questions will be published and distributed to collectors of customs.

Part IV.—SUEZ CANAL MEASUREMENT.

SUEZ CANAL MEASUREMENT RULES.

[Extract from the regulations for the measurement of tonnage, recommended by the International Tonnage Commission, assembled at Constantinople in 1873.]

GENERAL PRINCIPLES.

1. The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception), below the upper deck, as well as of all permanently covered and closed-in spaces on that deck.

N. B.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise, or for the berthing and accommodation of the passengers or of the officers and crew. Thus, any one or more openings, either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage, if they can be easily closed in after admeasurement, and thus better fitted for the transport of goods and passengers.

But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

2. "Deck loads" are not comprised in the measurement.

3. Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

4. The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

RULE I.—FOR MEASURING THE GROSS TONNAGE OF EMPTY VESSELS.

ARTICLE 1. The length for the measurement of ships having one or more decks is taken on the tonnage deck, which is—

(*a*) The upper deck for vessels having one or two decks.

(*b*) The second deck from below for vessels having more than two decks.

Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thick-

CREW ACCOMMODATIONS.

Mar. 2, 1895.

(a) The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. Every place appropriated to the crew of the vessel shall have a space of not less than seventy-two cubic feet and not less than twelve superficial feet, measured on the deck or floor of that place, for each seaman or apprentice lodged therein. The provisions of this Act requiring a crew space of seventy-two cubic feet per man shall apply only to vessels the construction of which shall be begun after June thirtieth, eighteen hundred and ninety-five. Such place shall be securely constructed, properly lighted, drained, and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from the effluvium of cargo or bilge water; and failure to comply with this provision shall subject the owner to a penalty of five hundred dollars. Every place so occupied shall be kept free from goods or stores of any kind not being the personal property of the crew in use during the voyage; and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged in that place the sum of fifty cents a day for each day during which any goods or stores as aforesaid are kept or stored in the place after complaint has been made to him by any two or more of the seamen so lodged. No deduction from tonnage as aforesaid shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate with these words, "certified to accommodate —— seamen."

Mar. 4, 1915. Sec. 6.

That on all merchant vessels of the United States the construction of which shall be begun after the passage of this Act, except yachts, pilot boats, or vessels of less than one hundred tons register, every place appropriated to the crew of the vessel shall have a space of not less than one hundred and twenty cubic feet and not less than sixteen square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

That in addition to the space allotment for lodgings hereinbefore provided, on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of twelve or more seamen,

there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every twelve seamen, constituting her crew, provided that not more than six bunks shall be required in any case.

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew, which shall conform to the requirements of this section, so far as they are applicable thereto, by providing sleeping room in the engine room of such steamboat, properly protected from the cold, wind, and rain by means of suitable awnings or screens on either side of the guards or sides and forward, reaching from the boiler deck to the lower or main deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

All merchant vessels of the United States, the construction of which shall be begun after the passage of this act having more than ten men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed ten, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of wash basins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than $50 nor more than $500: *Provided*, That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

DEDUCTIONS FOR OTHER PURPOSES.

(b) Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space. Mar. 2, 1895.

(c) Any space used exclusively for the working of the helm, the capstan, and the anchor gear, or for keeping the charts, signals, and other instruments of navigation and boatswain's stores, and the words "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

(d) The space occupied by the donkey engine and boiler, if connected with the main pumps of the ship.

between decks above the tonnage deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforesaid.

ART. 7. If there be a break, poop, or any other permanent closed-in space on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew, the tonnage of such space shall be ascertained as follows: Measure the internal mean length of such space in feet and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height and multiply by it the mean horizontal area; divide the product by 100, or by 2.83 if the measurements are taken in meters, in order to obtain the tonnage of such space.

ART. 8. In measuring the length, breadth, and height of the general volume of the ship or that of the other spaces, reduce to the mean thickness the parts of the ceiling which exceed it. When the ceiling is wanting, or when it is not permanently fixed, the length and breadth are reckoned from the frame of the ship.

RULE II.—FOR MEASURING GROSS TONNAGE OF LADEN SHIPS.

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aftside of the sternpost, deducting therefrom the distance between the aftside of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it.

Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then, having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid, then multiply this product by the factor 0.17 in the case of ships built of wood, and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed-in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces and dividing the product by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotients so

obtained shall be deemed to be the tonnage of such space, and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

DEDUCTIONS [1] TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE.

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net register tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to.

SAILING VESSELS.

ART. 12. For sailing vessels deduct the spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS.

ART. 14. For vessels propelled by steam or any other mechanical power, deduct—

1. The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage.

2. The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine rooms, and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

SHIPS HAVING COAL BUNKERS WITH MOVABLE PARTITIONS.

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms, and add to it, for

[1] Extract from the final report of the International Tonnage Commission assembled at Constantinople in 1873: "SEC. 17. It is recommended that a penal provision shall be enacted to the effect that if any of the permanent spaces which have been deducted shall be employed either for the use of merchandise or passengers, or in any way profitably employed for earning freight, that space shall be added to the net tonnage, and nevermore be allowed as a deduction."

screw steamers 75 per cent, and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner:

Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers.

Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown.

Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof.

Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

SHIPS WITH FIXED COAL BUNKERS.

ART. 17. In ships with fixed coal bunkers, measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or by 2.83 if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz:

(*a*) The spaces framed in round the funnels.

(*b*) The spaces required for the admission of light and air into the engine rooms.

(*c*) The spaces, if any, necessary for the proper working of the engines.

ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions, as set forth in article 16, may be applied.

ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage; all the spaces occupied by machinery, boilers, and coal bunkers may be deducted. Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

ADDITIONAL DEDUCTIONS ALLOWED BY THE SUEZ CANAL CO.

The company allows the following spaces to be included in the deductions specified at article 12 of the regulations for the measurement of tonnage, provided the deductions do not, in the aggregate, exceed 5 per cent of the gross tonnage:

(*a*) The chart room, even when also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(*b*) The cabins of the ship's doctors, if actually occupied by them.

(*c*) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms, one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers. A mess room, if there is one, for the exclusive use of the petty officers. No deduction is allowed for the officers' mess room in ships having passenger accommodation, which are not also provided with a passengers' mess room.

(*d*) All spaces fitted as bathrooms or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as is available for passengers when no bathroom for their exclusive use is provided.

(*e*) All spaces specially provided for the storage of electric searchlights, the wireless-telegraphy installation, and the operator's berth, on condition that they are situated on the upper deck.

The above specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

MEASUREMENT OF DECK SPACES (SUPPLEMENTARY RULES OF 1904).

For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

SHIPS WITH ONE TIER OF SUPERSTRUCTURES ONLY.

1. *Poop, bridge, forecastle.*—The following exemptions are allowed:

(*a*) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(*b*) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*c*) Such length of the forecastle measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(*d*) In each of the above three cases of superstructures, such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

2. *Poop and bridge combined, or forecastle and bridge combined.*—In each of these combined spaces the following exemptions are allowed:

(*a*) That length only which corresponds to the openings of the engine room and boiler spaces as specified in 1 (*b*), above.

(*b*) Such portions as are in way of openings not provided with any means of closing and corresponding to one another.

3. *Shelter decks.*—In the case of shelter decks the following exemptions are allowed

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES.

(*a*) The exemptions prescribed in paragraphs 1, 2, and 3, above, are applicable in their entirety to the lower tier only.

(*b*) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

REMARK.

Should a ship at any time transit with merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

MEMORANDUM BY THE UNIVERSAL MARITIME CANAL CO. OF SUEZ ON THE APPLICATION OF THE RULES OF 1904 RELATIVE TO THE MEASUREMENT OF SUPERSTRUCTURES.

[Paris, 1909.]

A. DEFINITION OF THE VARIOUS SPACES ABOVE DECK.

In making out the special tonnage certificate of the Suez Canal, the superstructures to be considered are the following:

1. *Isolated spaces.*—Poop, bridge, and forecastle.

2. *Combined spaces.*—Extended poop and extended forecastle. If the poop and forecastle are united by a continuous roof or deck and by walls likewise continuous to the bridge, the spaces thus united constitute, according to definition, a combined space—extended poop in the first case, and extended forecastle in the second case. A complete break either in the roof or walls reverts the case to the category of isolated spaces.

3. *Shelter deck.*—The three spaces united into one constitute a shelter deck.

The superstructures may have a single tier or several tiers. The treatment applicable to the first tier is not the same as that applied to the others, and each tier is to be measured separately.

B. DETERMINATION OF THE DECK SPACES TO WHICH THE RULES OF 1904 APPLY.

Under the rules of 1904 for the determination of Suez tonnage, the spaces hereunder defined are divided into three categories:

First category.—Spaces or portions of spaces closed in according to national measurement rules.

These spaces are always included in Suez tonnage; the rules of 1904 are not applicable to them.

In determining whether or not a space is in this category the Suez Canal Co. accepts the judgment of the national surveyors. Since the rules adopted in the different countries for the determination of national tonnage are considered as practically identical, the treatment of a space is the same for Suez tonnage whatever may be the flag of the ship.

Second category.—Spaces or portions of spaces open according to Suez measurement rules and national measurement rules.

These spaces are not included in the special tonnage certificate of the Suez Canal Co.; the rules of 1904 are not applicable to them.

According to the rules of the commission of Constantinople, the spaces of the second category are: The spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

The Suez Canal Co. recognizes in the meantime that a space may be considered as open, and consequently excluded from tonnage, if there is an opening not provided with means of closing, the breadth of which is equal to or greater than half the breadth of the deck oppo-

site the opening, and if the space can not be used to shelter other merchandise than deck cargo.

In order to make this last restriction exact, the company recognizes that the space between the open face and a line drawn parallel to this face at a distance equal to half the width of the deck opposite the opening can not be used to shelter merchandise other than deck cargo, and that the remainder of the space may be used to shelter merchandise other than deck cargo and is not to be considered as open.

On the other hand, if in the interior of the superstructure, because of any arrangement whatever and at a distance from the open face less than one-half the width of the deck, the opening becomes less than one-half the width of the deck (above indicated), only that portion of the space comprised between the open face and this point is to be considered as belonging to the second category; the remainder of the space falls within the third category.

Furthermore, in order that a space may be considered as open beyond a distance equal to one-half the width of the deck it is necessary that it be actually isolated from the other superstructures. This condition is not to be considered as fulfilled unless the space is separated from the superstructure immediately adjacent by a break (interval) in the roof and in the walls equal to at least half the width of the deck; if the widths of the deck opposite the openings of two adjoining superstructures are different, the smaller width is to be taken.

Third category.—Spaces or portions of spaces open according to the national measurement rules, but which are closed in according to the Suez rules, because they do not fulfill the conditions defined above for the second category.

It is to these spaces that the rules of 1904 are applicable.

C. NATURE OF THE EXEMPTIONS PERMITTED BY THE RULES OF 1904.

The rules of 1904 define the portions of the spaces comprised in the third category that may be exempted.

In these definitions the length of the ship indicated is the total length comprised between the interior face of the stem and the interior face of the rear sternpost, the measurement being taken at the half height of the superstructures.

It is moreover to be understood, in everything that follows, that in no case shall the exemptions include closed-in spaces or portions of closed-in spaces situated within exemptible parts.

I. Ships with One Tier of Superstructures.

1. ISOLATED SPACES.

The exemptions permitted are as follows:

(*a*) *Poop.*—The portion of this space situated at the stern equal in length to one-tenth of the length of the ship measured from the interior face of the rear sternpost and at half the height of the poop. (Figs. 23–26.)

(*b*) *Bridge.*—The portion of this space situated in way of the air spaces above the engine room and the boilers, it being understood that such air spaces are not considered to extend beyond the forward

bulkhead of the stokehold or the after bulkhead of the main engine room. (Figs. 27–30.)

When the air spaces above the engine room and boilers are separated by an interval, the portion of the bridge in way of this interval is exempted. (Figs. 29 and 30.)

The exemption of the portions of the bridge in way of air spaces has the effect of excluding the volume of these air spaces from the tonnage of the ship and therefore from the measurement of the engine room.

(*c*) *Forecastle.*—The portion of this space situated at the prow equal in length to one-eighth the length of the ship as measured from the interior face of the stem at half height of the forecastle. (Figs. 31–34.)

(*d*) In each of these three types of superstructures, the parts situated exactly opposite the openings not provided with means of closing and corresponding to each other in the walls of the ship. (Figs. 26, 30, and 33.)

2. COMBINED SPACES.

(*a*) *Extended poop.*—The extended poop is subject to exemption in the same way as a bridge (portion in way of air funnels), but is not subject to the exemption of one-tenth as is an ordinary poop. (Fig. 35.) The forecastle, separated from the extended poop, is granted the exemption of one-eighth.

It sometimes happens that in ships with isolated spaces the air funnels of the engine, instead of being situated in the bridge, are located in the poop. In this case the poop is treated the same as an extended poop and is in consequence measured; the bridge alone benefits from the exemption permitted in paragraph 1*d* above (parts opposite the openings in the walls of the ship). The forecastle is granted the exemption of one-eighth. (Fig. 36.)

(*b*) *Extended forecastle.*—The extended forecastle is granted the exemption accorded to a bridge (portion situated in way of air funnels), but it is not granted the exemption of one-eighth as in case of an ordinary forecastle. (Fig. 35.) The poop, isolated from the extended forecastle, is granted the exemption of one-tenth.

(*c*) In every combined space the portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the sides of the ship are exempted. (Figs. 35 and 36.)

3. SHELTER DECK.

In the case of shelter decks, the following exemptions are allowed: The portions situated exactly opposite openings in the side plating of the ship not provided with means of closing and corresponding to each other in the opposite walls of the ship are exempted. (Figs. 37 and 38.)

The air spaces situated within a shelter deck should be measured with the remainder of the volume of the engine room and deducted with the 75 per cent increment. (Figs. 37 and 38.)

II. SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES.

(*a*) The lower tier alone is granted all the exemptions provided for in paragraphs 1, 2, and 3 above, for ships with a single tier of superstructures. (Figs. 39 and 40.)

In order that the air spaces above the engine and boilers existing in the lower tier of spaces defined in paragraphs 1 and 2 above (isolated spaces and combined spaces) may be comprised in the volume of space occupied by the machinery and then deducted with the 75 per cent increment (fig. 41), the shipowner must forego the exemption of the space situated in way of air spaces (see above (*b*), p. 70) and forego the exemption of open parts which may exist in the extremities of the space (see above, second category, p. 69), as well as the exemption of parts situated opposite openings corresponding to each other in the walls of the ship. (See above, 1 (*d*) and 2 (*c*).)

(*b*) The upper tiers may not benefit by the exemption of portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the walls of the ship. (Figs. 39 and 40.)

The air spaces above the engine and boiler located in an upper tier may not be included in the volume of the engine and then be deducted with the 75 per cent increment (fig. 41), unless the shipowner foregoes the exemption of open parts which may exist in the extremities of the space (see above, second category, p. 69), and unless all the tiers below the tier under consideration are themselves measured the same as between decks.

(*c*) All the rules other than those which the company recognizes as in any category appertaining to a deck space (see above, pp. 69 and 70) are equally applicable to all the tiers.

D. CONDITIONS FOR THE APPLICATION OF EXEMPTIONS PROVIDED FOR BY THE RULES OF 1904.

In order that the exemptions permitted may apply, there must be neither merchandise nor supplies of any kind in the portions of spaces which are entitled to benefit by exemption.

If a ship but a single time during her transit carries any merchandise of whatever nature, or coal for bunker purposes, or supplies in whatever amount, in any part of an exempted space, the entire space is added to the net tonnage and may never again be exempted.

E. EXPLANATORY SKETCHES.[1]

The sketches following illustrate the treatment applicable to deck spaces in some characteristic cases.

The spaces or portions of spaces of the first category are indicated by slanting lines; they are designated by the letter F.

The spaces or portions of spaces of the second category are indicated in white; they are designated by the letter C.

The spaces or portions of spaces of the third category are indicated—

1. By horizontal lines when they are exempted; they are then designated by the letters: A, for the poop and forecastle; M (air funnels of engines) and *m* (in way of air funnels), for the bridge; O, for the openings in the walls.

2. By vertical lines whenever they are measured; they are in this case designated by the letter B.

[1] In "Measurement of Vessels for Panama Canal" the spaces or portions of spaces of the three categories are indicated by colors instead of by lines.

1. ISOLATED SPACES.

(a) Poop.

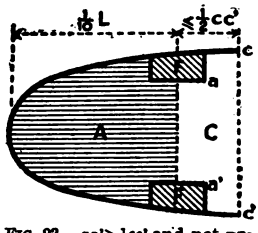


FIG. 23.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing.

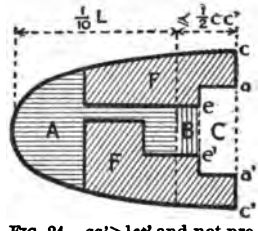


FIG. 24.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $ee' < \frac{1}{2}cc'$.

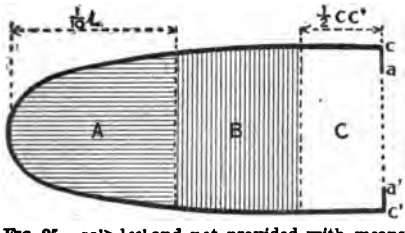


FIG. 25.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing.

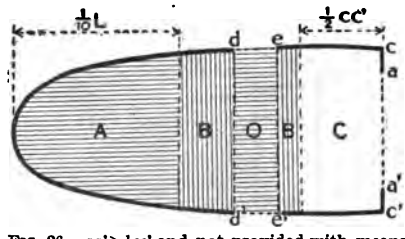


FIG. 26.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; de and $d'e'$ side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figures 23, 24, 25, and 26 it is supposed that the forward face of the poop is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

(b) Bridge.

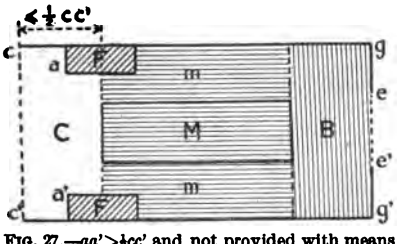


FIG. 27.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $ee' < \frac{1}{2}gg'$.

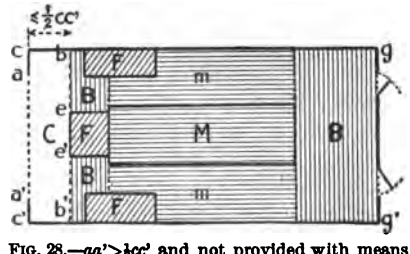


FIG. 28.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $be < \frac{1}{2}cc'$; $e'b' < \frac{1}{2}cc'$; gg', partition with doors.

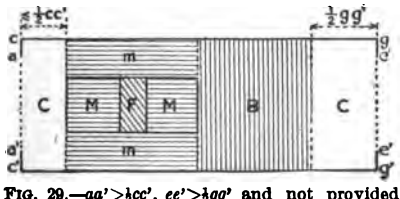


FIG. 29.—$aa' > \frac{1}{2}cc'$, $ee' > \frac{1}{2}gg'$ and not provided with means of closing.

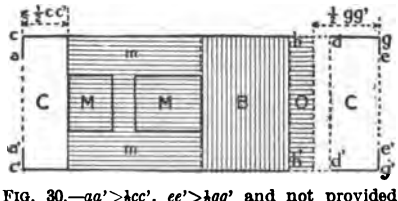


FIG. 30.—$aa' > \frac{1}{2}cc'$, $ee' > \frac{1}{2}gg'$ and not provided with means of closing; bd and $b'd'$ side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figures 27, 28, 29, and 30 it is supposed that the after face of the bridge is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck. The same supposition is made in figures 29 and 30 for the forward face of the bridge. In short, cc' and gg' should be the whole breadths of the deck.

1. ISOLATED SPACES—Continued.

(c) FORECASTLE.

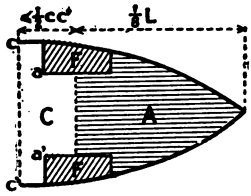


FIG. 31.—$aa' > \frac{1}{2}\,cc'$ and not provided with means of closing.

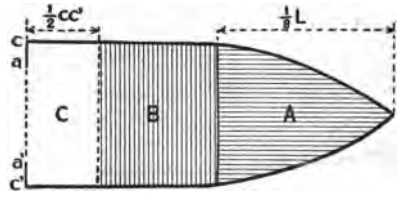


FIG. 32.—$aa' > \frac{1}{2}\,cc'$ and not provided with means of closing.

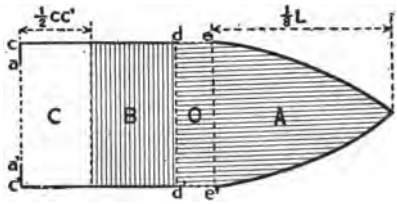


FIG. 33.—$aa' > \frac{1}{2}\,cc'$ and not provided with means of closing; de and $d'e'$, side openings not provided with means of closing and corresponding to each other in the walls.

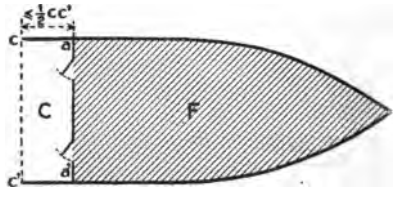


FIG. 34.—aa', partition with doors.

N. B.—In figures 31, 32, 33, and 34 it is supposed that the after face of the forecastle is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

2. COMBINED SPACES.

(*a*) or (*b*) Poop Extended or Forecastle Extended.

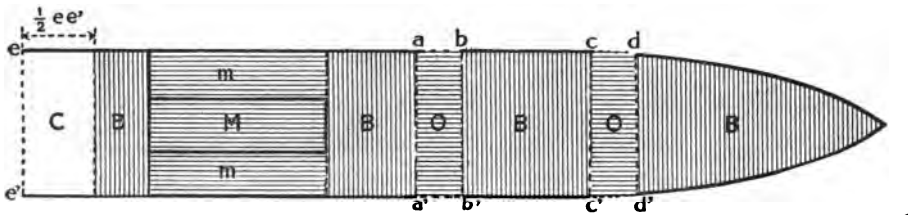


Fig. 35.—*ab* and *a'b'*, *cd* and *c'd'*, side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figure 35 it is supposed that the after face of the extended forecastle is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

(*a*) Poop Sheltering the Air Spaces of the Engine and Boilers.

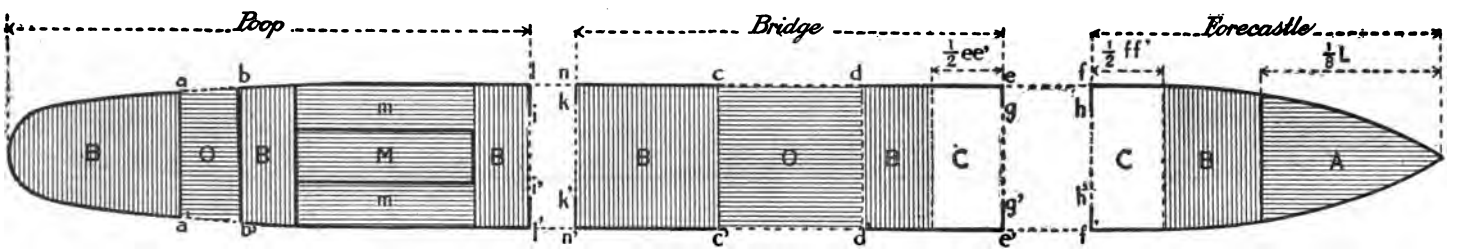


Fig. 36.—*ab* and *a'b'*, *cd* and *c'd'*, side openings not provided with means of closing and corresponding to each other in the walls; *gg'* and *hh'*, transverse openings not provided with means of closing and greater than one-half the corresponding breadth of the deck; *efe'f'*, break in the roof and in the walls greater than one-half of the least breadth of the deck at the extremities of the break; *ii'* and *kk'*, transverse openings of any breadth whatever and provided or not provided with means of closing; *lnl'n'*, break in the roof and in the walls less than one-half the least breadth of the deck at the right of *l* or *n*.

3. SHELTER DECK.

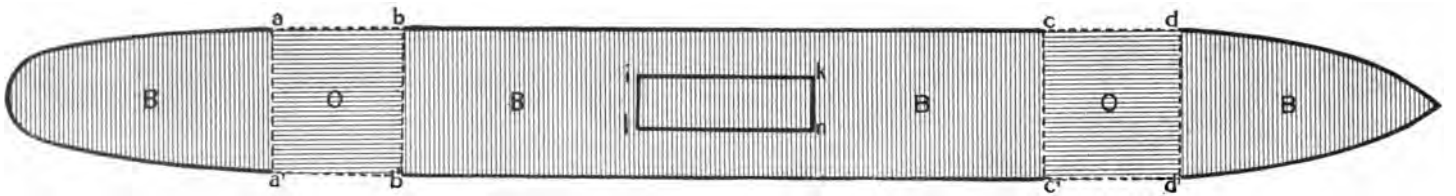


FIG. 37.—*ab* and *a'b'*, *cd* and *c'd'*, side openings not provided with means of closing and corresponding to each other in the walls; *iklm*, air spaces of the engine and boilers to include in the volume of the engine and to deduct with the increment of 75 per cent.

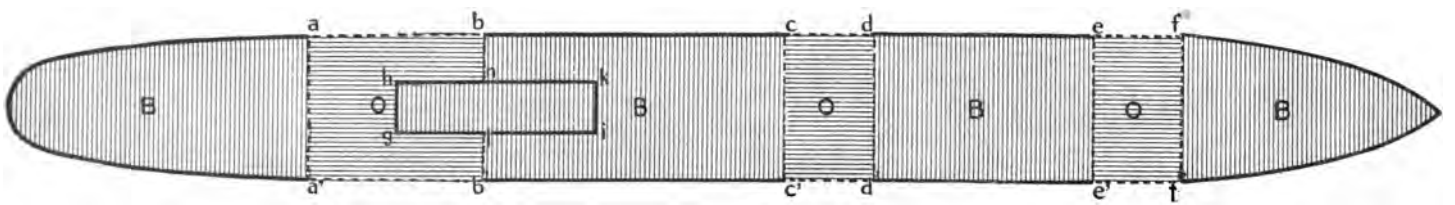


FIG. 38.—*ab* and *a'b'*, *cd* and *c'd'*, *ef* and *e'f'*, side openings not provided with means of closing and corresponding to each other in the walls; *ghiklm*, air spaces of the engine and boilers to include in the volume of the engine and to deduct with the increment of 75 per cent.

SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES.

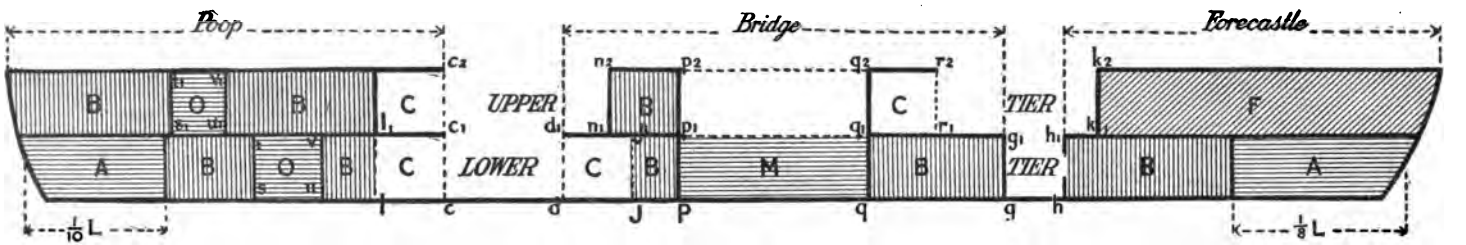


FIG. 39.—Longitudinal section of the superstructures (see the horizontal sections of superstructures in fig. 40). cc_1 and dd_1, c_1c_2 and r_1r_2, transverse openings not provided with means of closing and greater than one-half the corresponding breadth of the deck; cc_1d_1d and $r_1r_2k_1k_2$, breaks in the roof and in the walls greater than one-half the least breadth of the deck at the extremities of the opening; gg_1 and hh_1, transverse openings of any breadth whatever and provided or not provided with means of closing; gg_1hh_1, break in the roof and in the walls less than one-half the least breadth of the deck at the right of g or h; $lc=\frac{1}{2}$, the breadth of the deck at c; $dj=\frac{1}{2}$, the breadth of the deck at d; $l_1c_1=\frac{1}{2}$ the breadth of the deck at c_1; $q_1r_1<\frac{1}{2}$ the breadth of the deck at r_1; n_1n_2 and k_1k_2, partitions with doors; $stuv$ and $s_1t_1u_1v_1$, side openings not provided with means of closing and corresponding to a similar opening in the opposite wall; $p_1p_2q_1q_2$, air spaces of engines and boilers existing in this space are not included in the gross tonnage, but the parts of the space situated by their sides are measured.

SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES—Continued.

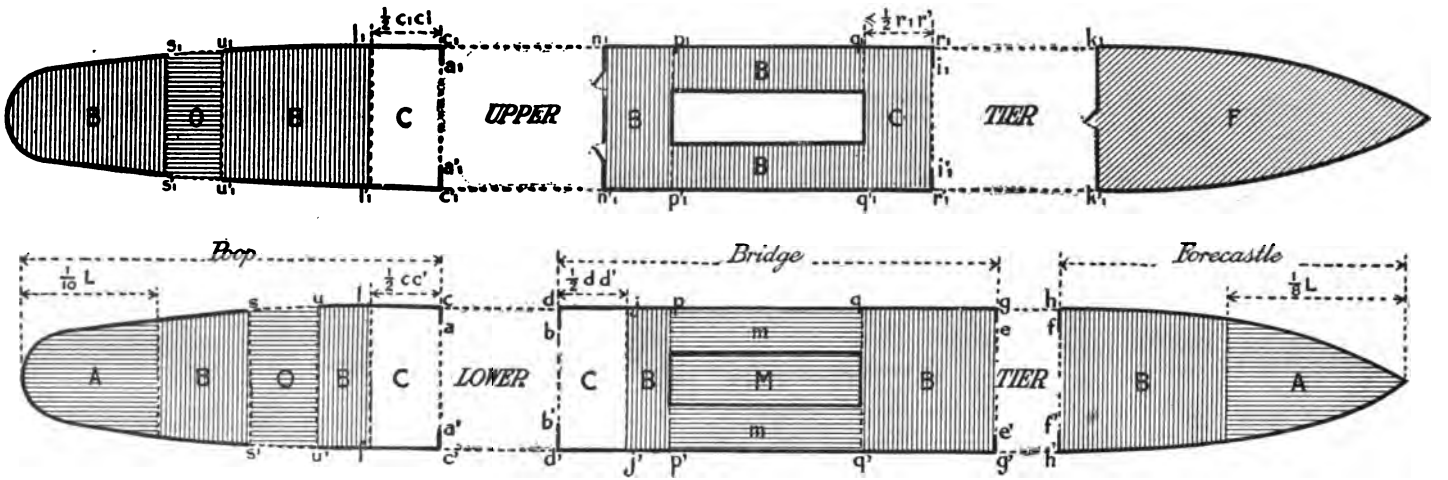


FIG. 40.—Horizontal sections of the superstructures (see the longitudinal section of the superstructures in fig. 39). aa' and bb', $a_1a'_1$ and $i_1i'_1$, transverse openings not provided with means of closing greater than one-half the corresponding breadths of the deck; $cdc'd'$, $c_1n_1c'_1n'_1$, $r_1k_1r'_1k'_1$, breaks in the roof and in the walls greater than one-half the least of the two corresponding breadths of the deck; ee' and ff', transverse openings of any breadth whatever and provided or not provided with means of closing; $ghg'h'$, break in the roof and in the walls less than one-half of the least of the two corresponding breadths of the deck; $n_1n'_1$ and $k_1k'_1$, partitions with doors; su and $s'u'$, s_1u_1 and $s'_1u'_1$, side openings not provided with means of closing and corresponding to each other in the walls; $p_1q_1p'_1q'_1$, air spaces of the engine and boiler rooms existing in this space are not included in the gross tonnage, but the other parts of the space situated by the sides of these air spaces are measured.

NOTE.—The portion of the upper diagram, q_1r_1 q_1r_1 marked C should be white; that is, it is of the second category.

SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES—Continued.

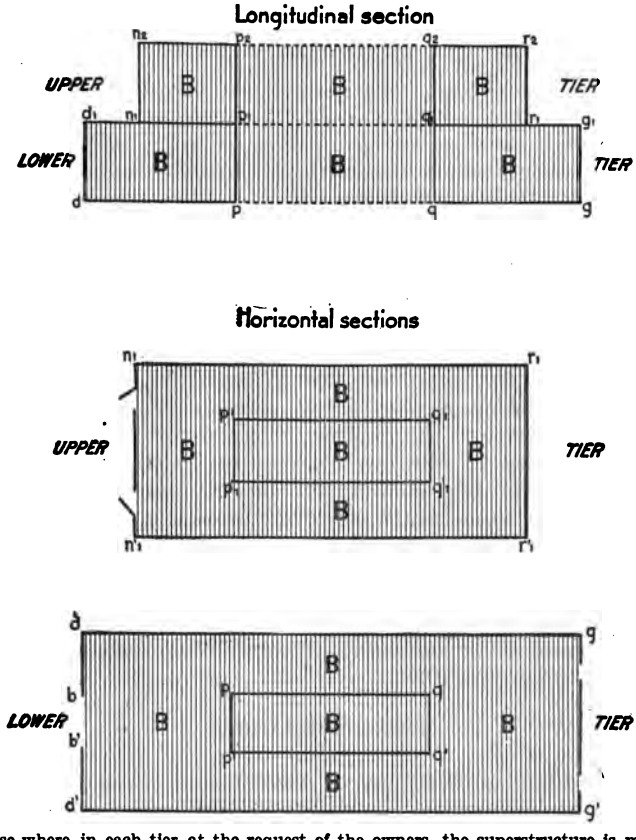


FIG. 41.—Case where, in each tier, at the request of the owners, the superstructure is measured as a between deck, the air spaces are included. dd', gg', $n_1n'_1$, $r_1r'_1$, in plan, and dd_1, gg_1, n_1n_2, r_1r_2, in elevation, are partitions with or without doors; dd' and $n_1n'_1$, in plan, entire breadth of the deck; $pqp'q'$ and $p_1q_1p'_1q'_1$, in plan, and pqp_1q_1 and $p_1q_1p_2q_2$, in elevation, are air spaces of the engine and boilers.

CONDITIONS OF APPLICATION.

Upper tier.—The air spaces existing in the upper tier can not be included in the volume of the engine, to be deducted with the increment of 75 per cent, unless the lower tier is itself measured as a between deck.

Lower tier.—The owner foregoes the exemption of the side parts of the air spaces of the engine and boilers.

N. B.—In the lower figure bb' is less than one-half dd'. If, on the contrary, bb' was greater than one-half dd' (see fig. 40), the owner would have, in order to get the benefit for the two tiers of the deductions of air spaces with the increment of 75 per cent, to forego, besides, the exemption of the open part extending forward from bb' over one-half breadth of the deck.

INSTRUCTIONS TO AMERICAN CUSTOMS OFFICERS.

PRELIMINARY.

ARTICLE 1. (*a*) The transit dues of the Suez Canal are charged on the basis of the net tonnage ascertained in accordance with the system of measurement recommended by the international commission which assembled at Constantinople in 1873. Extracts from the report of the commission, including the regulations for tonnage measurement, are printed on pages 61–68.

(*b*) Special Suez tonnage certificates will be issued on application by collectors of customs to American shipowners requiring them for ships which will use the Suez Canal.

(*c*) Blank Suez Canal tonnage certificates on application will be supplied by the Bureau of Navigation, Department of Commerce, Washington, D. C., to customs officers requiring them.

(*d*) The certificate signed by the Commissioner of Navigation, when properly filled in, signed, dated, and sealed by the collector of customs, will be given to the master or owner for the use of the ship.

(1) A duplicate, complete except as to the signature of the Commissioner of Navigation, will be retained in the files of the collector of customs issuing the certificate.

(2) On the issue of a certificate the collector of customs will transmit to the Commissioner of Navigation a memorandum, giving the name of the ship, official number, port of registry, gross and net tonnage according to her American certificate, also the date of issue of the special Suez certificate with the gross and net Suez tonnage.

GROSS TONNAGE.

ART. 2. (*a*) For the purpose of the special Suez certificate the measurer will include in the gross measurement the entire cubic contents of the ship under the uppermost deck, except the space (if any) between the inner and outer plating (upon whatever system constructed) known as a double bottom for water ballast, which can be certified as not available for the carriage of cargo, stores, or fuel. The deep water-ballast tanks known as fore or after peak tanks are to be included in tonnage measurement.

(*b*) In the case of vessels which have already been measured for American tonnage it will not be necessary to remeasure the tonnage under the uppermost deck unless the measurer finds that some space has formerly been exempted that must, under the Suez Canal rules, be included, or vice versa, or unless the American underdeck tonnage is measured under the modified regulation on page 17.

SPACES ABOVE DECK.

ART. 3. For the purpose of the special certificates the measurer must also include in the gross tonnage the entire cubic contents of every covered and closed-in space above the uppermost deck, and with regard to such spaces he should be guided by paragraph 1 of the Suez regulations, page 61, and by the instructions contained in

articles 4 and 5 below, which relate only to spaces entitled to exemption from United States tonnage measurement.

Spaces covered only by planks separated from one another by intervals exceeding 1 inch in breadth are not to be included in the gross tonnage.

OPEN SPACES.

ART. 4. (*a*) If the permanent opening measured at the end of the erection (forecastle, bridge space, or poop) is equal to or greater than one-half the breadth of the deck in way of it, and is not fitted with a coaming, the portion of the erection measured from the open end, and not exceeding in length such half breadth, is (subject to the following paragraph) to be regarded as an "open space" and described as such on the back of the Suez Canal certificate. When, however, a coaming is fitted to such an opening the space within it is to be included in the gross tonnage in every case, and only the exemptions provided for in article 5, are to be allowed.

(*b*) If in the interior of an erection, in consequence of any arrangement whatever, and at a distance from the open end less than half the breadth of the deck as above defined, the opening is at this point less than the said half breadth, only the length of the space between that point and the open end of the erection is to be regarded as an "open space" and described as such on the back of the Suez Canal certificate.

(*c*) The above instructions respecting "open spaces" apply to deck erections extending from side to side, whether situated in the lowest or any other tier, but in all cases where the openings in these erections are less than the half breadth of the deck in way of them they are to be measured in the gross tonnage and only the exemptions provided for in article 5 are to be allowed. When, however, two side-to-side erections are separated by an interval the length of which is less than the least half breadth of the deck in way of such interval, then, whatever be the breadth of the permanent openings, the erections less the interval are to be measured in the gross tonnage, and only the exemptions provided for in article 5 are to be allowed.

EXEMPTED SPACES.

ART. 5. In the case of shelter-deck spaces with one or more openings in the shelter deck and sides of the vessel the whole of the space under the shelter deck should be included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if any) in the sides of the ship.

(*a*) In all cases where a vessel is fitted with forecastle, bridge space, and poop there shall be exempted from measurement (1) such length of the forecastle measured from the inside of the stem at half height of the said forecastle as shall be equal to one-eighth of the full length of the ship; (2) such length of the poop measured from the inside of the stern timber at half height of the said poop as shall be equal to one-tenth of the full length of the ship; (3) such length of the bridge as is equal to the length of the actual deck openings to engine and boiler spaces, it being understood that such openings shall not be considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*b*) In all cases where the poop and bridge, or forecastle and bridge, are combined and continuous, then only that length in each case which is due to the openings of engine and boiler spaces as defined under paragraph (*a*), (3), above shall be exempted from measurement.

(*c*) From the side-to-side erections referred to in the foregoing paragraphs (*a*) and (*b*) further exemptions may also be allowed for the portions of the spaces abreast of the permanent openings (if any) in the side plating, and also for the "open spaces" referred to in article 4 above.

(*d*) When the engines are aft and the light and air casings are situated in an ordinary poop the space is to be dealt with as for a combined poop and bridge, but the bridge space is to benefit only by the exemption of the portion abreast the permanent openings (if any) in the side plating or "open spaces" at the ends.

(*e*) By "full length of the ship" shall be understood, in all cases, such length as is comprised between the inside of stem at half height of the forecastle to the inside of the stern timber at half height of the poop.

(*f*) The exemptions provided for in paragraphs (*a*) and (*b*) above apply, in their entirety, only to deck erections situated in the lowest tier; the only exemptions to be made in side-to-side erections situated above this tier, and besides the "open spaces" (if any), are those portions immediately abreast of any permanent openings which may exist in the side plating.

(*g*) In the case of shelter-deck spaces, the exemptions provided for may be allowed on the written request of the owners, either in the shelter-deck space, as provided for in the first paragraph, or in the erections on the shelter deck as provided for in paragraphs (*a*) and (*b*), but in no case are exemptions to be allowed under the first paragraph in addition to exemptions under paragraphs (*a*) and (*b*).

LIGHT AND AIR CASINGS OVER ENGINES AND BOILERS.

ART. 6. The engine and boiler casings in the shelter-deck spaces are to be included in the gross tonnage and in the engine-room measurement, even if situated in part within an otherwise exempted space abreast permanent side openings.

In the case of side-to-side erections above the lowest tier the light and air casings may be included in the gross tonnage and actual engine room, provided the owner makes a written application for same, and also on condition that the side-to-side spaces beneath it have been similarly treated. When, however, the spaces are so dealt with no exemption is to be made from such spaces for any other portion whatever, either in the tier in question or in those beneath it.

Subject to the foregoing the light and air casings in all erections above the first tier are to be exempted from measurement.

MARKING OF EXEMPTED SPACES.

ART. 7. All exempted spaces must be permanently and conspicuously marked by a plate securely fixed to each side of the vessel to indicate the limits and length allowed, corresponding with the par-

ticulars shown upon the back of the Suez Canal certificate; the center of such plates should be marked thus and the inscription upon them should be as follows:

This space ..... feet in length from the inside of the { stem / or / stern timber } at the half height of the space to this mark is exempted from Suez Canal tonnage upon the ground that no cargo or stores are carried therein.

ACCESS.

ART. 8. The measurers must see that some satisfactory means are provided either by manhole or hatchway for gaining access to the exempted parts, in the event of the parts adjacent being filled with cargo. It would be well in all cases for the manhole or other opening to terminate at the point to which the exempted space extends.

PENALTY FOR CARGO IN EXEMPTED SPACES.

ART. 9. The regulations of the Suez Canal Co. provide that if at any time a vessel shall perform transit with cargo or stores carried in any portion of any exempted space, then the whole of that space shall be added to the net tonnage and can only be again exempted from measurement after a bona fide change in the ownership of the vessel.

NET TONNAGE.

ALLOWANCE FOR PROPELLING POWER.

ART. 10. Having ascertained the gross tonnage in the manner described above, the measurer will then proceed to measure the engine room, boiler space, and shaft trunk as for a certificate of American registry, and note in the proper place in the measurement form and on the certificate the cubic contents of each.

In cases where the owners elect not to use the "Danube rule"[1] but to have the actual bunker space as well as the actual engine space measured and deducted, the measurer will measure separately the bunkers, and record the cubic capacity of each in the proper place in the measurement form. In doing this he is not to include any bunkers that are not absolutely permanent, or from which the coals can not be directly trimmed into the engine room or stokehold, or into which any access can be obtained otherwise than through the ordinary coal chutes on deck and from the doors opening into the engine room or stokehold. He is to be specially careful that thwartship bunkers which can be in any way extended are not included in the measurements for deductions.

In no case, except in the case of tugs, is the engine-room allowance to exceed 50 per cent of the gross tonnage of the ship.

[1] If the ship has not permanent bunkers, or if she has only lateral bunkers, and her coal is stowed in bunkers shut off from the hold by movable partitions, then the spaces of these lateral and temporary bunkers are not to be measured. In this case the rule to be applied is that in force on the Danube, namely, an allowance is made for the coal space by giving 50 per cent of the space occupied by the engine in a paddle-wheel steamer and 75 per cent in a screw steamer.

CREW-SPACE DEDUCTIONS.

ART. 11. In measuring the deductions for crew space the measurer will be careful to ascertain the cubic contents of each space as at present, but he must bear in mind that no deduction is to be made for the accommodation of the captain, purser, clerk, etc., or for the berths of stewards, cooks, in passenger steamers, or passengers' servants. Passages exclusively for access to deducted crew spaces may themselves be included in the deductions.

The following special deductions in respect of accommodation spaces are allowed:

(*a*) Doctors' cabins, if actually occupied by the doctors.

(*b*) All spaces fitted as bathrooms, or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(*c*) A mess room, if there is any, for the exclusive use of the officers; a second mess room, if there is any, for the exclusive use of the engineers; and a third mess room, if there is any, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess room in ships having passenger accommodation, which are not also provided with a passengers' mess room.

No deduction is to be allowed for crew space or for officers' cabins unless the regulations as to lighting, seaworthiness, ventilation, etc., are complied with, nor unless the words "Certified to accommodate —— seamen," "Certified to accommodate —— officer or —— officers," as the case may be, are cut in or painted on or over the doorway of each deducted space.

All water-closets having been included in the first place in the gross tonnage, those that are to be included in the deduction from tonnage are to have the words "Certified for the use of —— crew" cut in or painted on or over the door.

In the case of passenger steamers on which there is only one galley, neither the galley nor the space occupied by the cook should be included in the deductions from the gross tonnage.

When there are two or more galleys, however, the space occupied by the galley or galleys exclusively used for the crew should be included in the deductions, and the words "Certified for the use of the crew" should be cut in or painted on or over each doorway of the space.

NAVIGATION-SPACE DEDUCTIONS.

ART. 12. Articles 12 and 14 of the Suez Canal Co.'s regulations allow the deduction of any covered and closed-in spaces on the upper deck used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation. Under this rule the wheelhouse, chart room, winch house, lookout house, signal house, steam-steering house, and the spaces provided for the storage of electric searchlights and wireless-telegraphy appliances on the upper deck are to be deducted from the gross tonnage, in which, however, they are in every case first to be included.

The chart room may be deducted, even if it is also used as the captain's cabin. When, however, the captain's accommodation com-

prises several rooms, one of which is the chart room, that room alone is deducted; but, in all cases, the room used as a chart room must, if it is to be deducted, be situated on the upper deck.

When the donkey boiler in a closed-in space on the upper deck is not exclusively used for the working of the helm, the capstan, and anchor gear, or any of them, but is also available for hoisting the cargo, the space is not to be included in the deductions from the gross tonnage.

This instruction does not apply to the donkey-boiler house on the upper deck of men-of-war and troop ships.

MARKING OF DEDUCTED SPACES.

ART. 13. In granting deduction for the chart house, winch house, and wheelhouse, or any other covered and closed-in space on the uppermost deck used for navigating the ship, the measurer must see that the words "Certified for use in navigating the ship" are cut in or painted on or over the doorway of the space, and in like manner all spaces deducted from the gross tonnage are to have cut over them or painted on them a notice stating the purpose for which they are certified.

GENERAL.

ART. 14. In no case is any space to be deducted from the tonnage that is not first included in the gross tonnage, and in no case is the sum total of the deductions (other than the allowance for propelling power) to exceed 5 per cent of the gross tonnage of the ship.

No deduction is to be made for passenger accommodation, captain's or passengers' water-closets or lavatories, etc., passengers' cooking houses, or baggage storerooms, or for any other purpose than those indicated above.

It may happen that there are in certain ships some awnings or other constructions used merely for shelter (see second part of note to paragraph 1, Suez Canal Co.'s regulations), the space under which is not to be included in the gross tonnage, and is therefore not to be deducted afterwards. When this is so, the measurer should make a careful note of the particulars in the proper place in the forms.

When the collector is in any doubt whether any space should be exempted or deducted, he should apply for instructions to the Commissioner of Navigation.

INDEX TO PART IV.—SUEZ CANAL MEASUREMENT.

	Page.
Access to exempted spaces	83
Additional deductions:	
Chart room	67
Doctor's cabin	67
Officers' and crew's bathrooms	67
Officers' mess room	67
Searchlights, etc	67
Awning decks, etc	61
Blank tonnage certificates, who supplies	80
Cargo in exempted spaces, penalties for	68, 83
Categories:	
First	69
Second	69
Third	70
Coal bunkers with fixed partitions	66, 83
Coal bunkers with movable partitions:	
Danube rule	65, 83
Closed spaces for passengers	61
"Closed-in" spaces, definition of	61
Combined spaces	69, 71
"Deck loads"	61
Deducted spaces, marking of	85
Deductions permitted for sailing vessels:	
Crew spaces	65, 84
Navigation spaces	84
Limit of	65
Method of measuring	65
Deductions permitted for steamships:	
Coal spaces, fixed bunkers for	66
Coal spaces, bunkers with movable partitions	65

	Page.
Deductions permitted for steamships—Con.	
Limit of propelling power	65
Method of measuring engine spaces	66
Propelling power allowance	65, 66
Propelling power allowance for tugs	67
Same deductions as for sailing vessels	65
Deductions prohibited:	
Captain's quarters	84
Purser's, clerk's, etc., quarters	84
Berthing for stewards, etc., in passenger steamers	84
Doubts, submit to Commissioner of Navigation	85
Engine rooms	65, 66
Engine spaces in shelter deck	71
Engines in ordinary poop	82
Exempted spaces, marking of	82
Exempted spaces, not deductible	85
Exemptions permitted in first tier of superstructures:	
Applicable to spaces excluded from national register	68
Extended forecastle	68, 71
Extended poop	68, 71
Bridge	68, 70
Forecastle	68, 71
Poop	68, 70
Shelter deck	68, 71
Spaces in way of openings in side walls	71, 72
Exemptions permitted in tiers above the first	68
Exemptions provided for, permitted on written request	82
Explanatory sketches	72, 79
Full length of the ship	70, 82
Gross tonnage, definition of	61
Gross tonnage measurement of empty vessels for:	
Under deck	61
Between decks	63
Deck erections	64
Gross tonnage, measurement of laden vessels for	64
Light and air spaces	65, 82
Light and air spaces above lowest tier	72, 82
Memorandum of tonnage certificate, transmit to Commissioner of Navigation	80
Open spaces	61, 69, 81
Passenger accommodations, not deducted	84
Penalty for cargo in exempted spaces	68, 83
Side to side erections	82
Tonnage certificate, who issue	80
Tonnage certificate in files of collector of customs	80
Tonnage certificate furnished to master or owner, who signs	80
Tonnage deck	61
Tonnage dimensions of ceiled vessels	64
Tonnage dimensions of unceiled vessels	64
Transit dues, basis for	80
Vessels previously measured for national certificate	80

Part V.—MEASUREMENT OF UNITED STATES NAVAL VESSELS FOR THE SUEZ CANAL.

INSTRUCTIONS AND REGULATIONS.

[Compiled and prepared by the scientific and computing branch of the Bureau of Construction and Repair, Department of the Navy, 1909.]

GENERAL INSTRUCTIONS.

1. UNIFORMITY IN MEASUREMENTS.—These instructions are compiled for use in the preparation of tonnage certificates, upon which tonnage tolls may be collected, when ships of the United States Navy have occasion to pass through the Suez Maritime Canal, and it is of great importance not only that the following laws and regulations be followed, but that all the required measurements be taken, and calculations made, in one uniform and correct manner, so that one general system may prevail throughout.

2. FEATURES NOT COVERED BY REGULATIONS.—Whenever, in any calculation, new features arise, which are not clearly covered by these rules, instructions, etc., causing doubt as to method of procedure, the discussion thereof shall be referred to an officer of the bureau and his decisions relative thereto shall be appended to and made a part of these instructions, after reference to and approval by the chief constructor, if deemed necessary.

3. PREPARATION OF CERTIFICATES.—Suez Canal certificates of tonnage shall be prepared in full detail from careful calculations made in accordance with the following statutes, regulations, and instructions, and special care shall be exercised in their preparation in order that no incomplete or obscure entries shall appear in a certificate, which might constitute ground for investigation or possible remeasurement on the part of the canal authorities.

4. RECORD OF CERTIFICATES.—A full and careful record shall be entered in a book to be known as the tonnage book and in the general form of the certificate of the results of any and all tonnage calculations which may be made; also the drawings and figures made in connection with the preparation of any certificate shall be preserved in the files of the scientific and computing branch of the Bureau of Construction and Repair.

5. USE OF RULE FOR LADEN SHIPS.—In general calculations, measurements will be taken in the manner prescribed for unladen ships, whenever possible, but when, due to the absence of plans and records or to special hardships or difficulties, that method is rendered impracticable, the rule for laden ships may be employed. This condition will probably seldom arise, but the exception is inserted to cover a possible case.

6. REMEASUREMENT UNDER RULE FOR UNLADEN SHIPS.—Any ship which may have, of necessity, been measured while laden, shall, at the earliest practicable time thereafter, be measured in the usual

manner, and the results thus obtained shall supersede such previous calculation.

7. SHIPS PREVIOUSLY UNDER FOREIGN FLAGS.—Whenever it becomes necessary to provide a Suez Canal certificate for any vessel which may have been previously registered under a foreign flag, and have had a foreign certificate issued to her prior to becoming the property of the United States, a new calculation shall be made in accordance with these instructions, and a new certificate shall be issued, which shall constitute the correct Suez tonnage for that vessel.

8. ALTERATION OF CERTIFICATES DUE TO CHANGES.—If after a certificate has been issued to any naval ship it becomes necessary to change or alter her by the addition or removal of any space which will affect the tonnage, such spaces shall be measured and a new certificate issued, which shall represent the correct tonnage of the ship after the addition or deduction shall have been made.

9. USE OF FIGURES FROM A PREVIOUS CALCULATION.—When in preparing the Suez certificate any vessel's national certificate of registry is available, it will not be always necessary to remeasure the tonnage under the uppermost deck, unless it is found that some space has been exempted in such certificate of registry that must, under these rules, be included, or vice versa, provided the certificate has been issued by a country which had previously adopted a system of tonnage measurement similar in its essential features to the system herein below.

10. DESIRABILITY OF RETAINING ORIGINAL FIGURES.—Whenever changes in a ship's arrangement necessitate alterations in a certificate, it is to be understood that it is desirable that the original figures for below and between deck spaces be retained, if possible; therefore no new figures will be made for such spaces unless directly affected by the changes in the ship, as the small differences, due to a new calculation, are of minor consequence and are to be avoided.

11. MEASUREMENTS FROM PLANS.—Measurements taken from finished plans of any naval vessel, corrected to cover the latest arrangements affecting tonnage spaces, shall be considered to be as accurate and useful in the calculation of tonnage as dimensions lifted directly from the ship, inasmuch as these plans are taken from work under the direction of a representative of the Bureau of Construction and Repair.

12. SISTER SHIPS.—In determining the tonnage of sister ships, actually built from the same lines and molds and having nearly similar arrangements, it will be necessary to calculate the similar portions in the case of one ship only; the results shall then be considered to apply equally well to any of such ships.

13. SPACES REASONABLE IN EXTENT.—In vessels of the Navy all spaces as constructed or as altered shall be considered as being reasonable in extent, since it is clearly disadvantageous to the Navy to evade any tonnage dues at the expense of maximum efficiency of general arrangement of a ship's compartments.

14. CERTIFICATION OF SPACES.—All spaces on vessels of the Navy shall be considered as having been properly certified, since it is usual on naval ships to clearly designate the use of a compartment by a name plate over the doorway or opening thereto.

15. FULFILLMENT OF REQUIREMENTS.—The requirements for lighting, ventilation, and seaworthiness shall be considered as having been

fulfilled in all spaces on United States naval vessels, whether assigned to officers, crew, machinery, for the passage of light and air, or for any other purpose.

16. ACCURACY OF MEASUREMENTS.—All general measurements will be sufficiently accurate if carried to the nearest hundredth of a foot.

17. DEVIATION FROM METHOD.—Although the rules and regulations as hereinafter laid down will, in general, fully cover the measurement of ships of various forms and diversified construction, it must be borne in mind that in order to obtain a correct result when the prescribed method is inadequate, in detail, the geometrical formula best adapted to the results to be obtained shall be utilized.

18. EXEMPTED SPACES.—Should there be any spaces exempted in figuring the tonnage of a ship, such spaces should be enumerated on the certificate, and when no spaces are exempt that fact should be noted.

19. TO REDUCE TONS TO CUBIC METERS.—In order to change tons of 100 cubic feet each to cubic meters multiply by the factor 2.83.

GROSS TONNAGE.

In obtaining the gross tonnage of any United States naval ship the rules for measurement of ships of American register shall prevail (see Revised Statutes of the United States Nos. 4150, 4153, etc.), with such modifications as may be made necessary by the "Regulations for the Navigation of the Suez Maritime Canal."

1. DEFINITION OF GROSS TONNAGE.—The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception) below the upper deck, as well as of all permanently covered or closed-in spaces on that deck.

2. DEFINITION OF COVERED OR CLOSED-IN SPACES.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise or for the berthing and accommodation of the passengers, or of the officers and crew. Thus, any one or more openings either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage if they can be easily closed in after admeasurement and thus better fitted for the transport of goods and passengers. But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads." "Deck loads" are not comprised in the measurement.

3. SHELTER DECKS.—In the case of shelter-deck spaces the whole of the space under the shelter deck is included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if there are any) in the sides of the ship.

4. DEFINITION OF TONNAGE DECK.—The tonnage deck in vessels having three or more decks to the hull shall be the second deck from

below; in all other cases the upper deck of the hull is to be the tonnage deck.

5. MEASUREMENTS.—All measurements to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

6. METHOD OF MEASURING UNLADEN SHIPS (RULE I).—The register tonnage of every vessel built within the United States, or owned by a citizen or citizens thereof, shall be her entire internal cubical capacity in tons of 100 cubic feet each, to be ascertained as follows:

Below tonnage deck.—Measure the length of the vessel in a straight line along the upper side of the tonnage deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the vessel belongs.

The classes shall be arranged as follows:

Class 1. Vessels of which the tonnage length, according to the above measurements, is 50 feet or under—into 6 equal parts.

Class 2. Vessels of which the tonnage length, according to the above measurements, is above 50 feet and not exceeding 100 feet—into 8 equal parts.

Class 3. Vessels of which the tonnage length, according to the above measurements, is above 100 feet and not exceeding 150 feet—into 10 equal parts.

Class 4. Vessels of which the tonnage length, according to the above measurements, is 150 feet and not exceeding 200 feet—into 12 equal parts.

Class 5. Vessels of which the tonnage length, according to the above measurements, is above 200 feet and not exceeding 250 feet—into 14 equal parts.

Class 6. Vessels of which the tonnage length, according to the above measurements, is above 250 feet—into 16 equal parts.

Then the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length, as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling, which is between the bilge planks and limber strake; then if the depth at the midship division of the length does not exceed 16 feet divide each depth into 4 equal parts; then measure the inside horizontal breadth at each of the three points of division and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breadth 1, and so on down to the lowest breadth; multiply the second and fourth by 4 and the third by 2; add these products together, and to

the sum add the first breadth and the last, or fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet divide each depth into 6 equal parts instead of 4 and measure as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by 4 and the third and fifth by 2; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively one, two, three, etc., number one being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into 6 or 16 parts, as in classes 1 and 6 or any intermediate number, as in classes 2, 3, 4, and 5, multiply the second and every even-numbered area by 4, and the third, and every odd-numbered area, except the first and the last, by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck; divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed the register tonnage of the vessel, subject to the additions hereinafter mentioned.

Inner bottom.—In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall, for the purposes of measurement, be deemed to represent the floor timber.

Between decks.—If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

Measure, in feet, the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage deck is divided; measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively one, two, three, etc., commencing at the stem; multiply the second, and all other even-numbered breadths by 4 and the third and all the other odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two

decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100 and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel, ascertained as above directed. And if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage decks, shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as above directed.

Deck houses, breaks, etc.—If there be a break, a poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained and added to the gross tonnage.

Measure the internal mean length of such space in feet and divide it into an even number of equal parts, of which the distance asunder shall be most nearly equal to those into which the length of the tonnage deck has been divided; measure at the middle of its height the inside breadths, namely, one at each end and at each of the points of division, numbering them successively one, two, three, etc.; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks and multiply by it the mean horizontal area; divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

7. OPEN VESSELS.—Open vessels are not comprised within the proposed international rules of measurement.—Report of the International Tonnage Commission, assembled at Constantinople in 1873, section 16.

8. METHOD OF MEASURING LADEN SHIPS (RULE II.)—In order to enable those who may be charged with the calculation of tonnage of ships of the United States Navy to properly interpret such figures as may appear in any certificate prepared by the Suez authorities themselves, it may be well to quote the method followed in the measurement of laden ships which have no certificate to accompany an application for passage through the canal.

The deductions from the gross are the same as those appearing under the heading "Net tonnage," but the total capacity or gross figure is arrived at as follows:

RULE II.—FOR LADEN SHIPS.

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aft side of the sternpost, deducting therefrom the distance between the aft side of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it.

Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid; then multiply this product by the factor 0.17 in the case of ships built of wood, and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed-in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces, and dividing the products by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotients so obtained shall be deemed to be the tonnage of such spaces, and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

9. HATCHES.—The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together, and the product by the mean depth taken from the top of beam to the underside of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage, and the remainder only shall be added to the gross tonnage of the ship, exclusive of the tonnage of the hatchways.

10. LIGHT AND AIR SPACES TO MACHINERY.—On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to the gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage. Such space or spaces must be reasonable in extent, safe, and seaworthy, and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery, or for the admission of light and air to the machinery or boilers of the ship.

11. EXEMPTIONS.—For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

I. SHIPS WITH ONE TIER OF SUPERSTRUCTURES ONLY.

(1) *Poop, bridge, forecastle.*—The following exemptions are allowed:

(*a*) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(*b*) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*c*) Such length of the forecastle, measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(*d*) In each of the above three cases of superstructures, such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

(2) *Poop and bridge combined, or forecastle and bridge combined.*—In each of these combined spaces, the following exemptions are allowed:

(*a*) That length only which corresponds to the openings of the engine room and boiler spaces as specified in (*b*) above.

(*b*) Such portions as are in way of openings not provided with any means of closing and corresponding to one another.

(3) *Shelter decks.*—In the case of shelter decks, the following exemptions are allowed:

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

II. SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES.

(*a*) The exemptions prescribed in paragraphs (1), (2), and (3) above are applicable in their entirety to the lower tier only.

(*b*) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

12. USE OF EXEMPTED SPACES.—Should a ship, at any time, transit with merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

INSTRUCTIONS AND DEFINITIONS AS TO GROSS TONNAGE.

1. DECKS NOT CONSIDERED CONTINUOUS.—In deciding which deck fulfills the requirements for a tonnage deck, neither the platform decks when composed of several flats nor the armored protective deck when such protective deck merges into and forms only a portion of another deck shall be considered a complete deck, within the interpretation of the meaning of the law.

2. BREAK DECKS, IN TWO-DECKED SHIPS.—If the second deck from the keel, in a two-decked vessel, consists of several partial decks, extending, with breaks, from the stem to the stern, the line of that course of decks must be taken as the tonnage deck; and if the partial decks are at different heights, the line of the lowest flat will be taken as the tonnage deck, and the headroom above such line and under the higher flats will be measured and added as inclosures above decks.

3. BREAKS—DEFINITION OF.—A break is the space above the line of the deck when that deck is cut off and continued at a higher elevation. The height of a break is the distance from the underside of the deck cut off to the underside of the break deck.

4. BREAKS IN INNER BOTTOM.—When it is necessary to establish the below-deck volume of a vessel with an irregular or broken inner

bottom, the length of the ship should be divided into sections, of lengths, equal to the unbroken portions of the inner bottom lines, and after subdividing each of such sections into parts, according to the class under which the sections respectively belong, the volume of each should be calculated separately, in such manner as to determine, as exactly as possible, the volume of the hold. Where lengths of sections are 30 feet or under, they may be divided into two equal parts. When the underdeck tonnage is measured in parts in consequence of a break or breaks in the double bottom, the tonnage depth at the middle of the tonnage length will determine the number of parts into which the remaining depths are to be divided.

5. SPRING OF BEAM.—The round or spring of the beam is the perpendicular distance from the crown of the underside of the deck plank or plating at center to a line stretched athwart the vessel from end to end of the top of the beam, and it is to be ascertained at every place where it is to be used in the measurement.

6. HALF BREADTHS AT SIDE.—If there be no ceiling, plating, or planking on the inside of a ship's frames, the half breadths shall be taken to the inside of the frame members.

7. LOWEST BREADTHS ON SECTIONS.—The bottom widths are to be taken only so far as the apparent flat of floor extends. Where there is a perceptible rise immediately from the keel, the bottom widths should be taken equal to the width of the keelson and no compensation made for the rise of floor or turn of the bilge.[1]

8. WEB-FRAME CONSTRUCTION.—For ships constructed with web frames, at intervals of the length, the measurements should be taken to the interior faces of the ordinary frames, ignoring the greater depth of the web-frame construction.

9. BATTENS OR SPAR CEILING.—When the ceiling of a hold or other space is open in construction and consists of battens spaced apart, the breadths should be taken to the inside of the average thickness of battens, between points of measurement.

10. INSULATION FOR REFRIGERATION.—When a ship's compartments are insulated for refrigerating or other purposes and the insulating material extends inboard of the frames or above the tops of floors or inner bottom, the half breadths and heights shall be taken to the inside of the average thickness thereof.

11. TONNAGE SECTIONS OF IRREGULAR FORM.—When any tonnage section is of such an irregular form, due to peculiar arrangement of the inner bottom or to any other cause that the area will not be correctly produced by the ordinary method, such irregularities may be figured and added to or subtracted from the area found by the prescribed process, as the case may be.

12. VOLUME OF RAM BOW.—That portion of a ship forward of the No. 1 tonnage section, known usually as the ram bow, and fitted with plate framing in which lightening holes are cut, shall be figured and added to the gross tonnage, but the breadths shall be taken to lines representing the inboard sides of frames of the same depths as those used in the forward end of the ship adjacent this space. The same method shall apply in the case of a projecting stern.

[1] Attention is called to the English Merchants Shipping Act of 1894 as revised (see Instructions Relating to the Measurement of Ships, ed. 1913, p. 67; also par. 118, p. 43, and par. 24, p. 11), showing their method of calculating volume below decks in ships with a rise of floors.

13. CEMENT IN TONNAGE SPACES.—Where quantities of cement are used in a ship's compartments the volumes of the spaces are to be figured to the framing of the ship, as if the cement were not present.

14. BALLAST TANKS NOT INNER BOTTOM.—Peak tanks are not to be in any case exempt from measurement, and side ballast tanks are to be included in the gross tonnage, except when built without the inside of the framing of the ship; such, for instance, as the "Raylton Dixon system" of topside tanks, which may be exempted provided they are not used for cargo, stores, or fuel.

15. FEED WATER AND FUEL OIL IN BOTTOMS.—Spaces in the double bottoms made tight for reserve feed water or fuel oil are to be exempted from measurement just as is done in the case of ordinary water bottoms for ballast water.[1]

16. COFFERDAMS.—The cofferdams above the protective deck and in general are not to be considered exempted spaces, but are to be measured and included in the gross figures, except when actually forming a continuation of the inner bottom and when not used for cargo, stores, or fuel, cellulose being considered cargo in warships.

17. SPACE AT AFTER END OF SHAFT TUNNEL.—The compartments through which the shaft tubes pass, abaft the tunnel and forward of the stuffing box, sometimes known as the stuffing-box compartment, will not be exempted in the figuring of tonnage, unless such space is made water-tight and forms the only inner bottom in the location considered. When forming a part of the after peak-tank space it is not to be exempted space.

18. BETWEEN DECK, POOP, AND FORECASTLE LENGTHS.—When taking measurements for lengths to the bow or stern on ships where framing is present instead of stem or sternposts, such measurement shall be taken at half the height of space concerned and to the inside of the frame, but when ceiling is fitted the length shall be taken to the inside of the average thickness thereof.

19. HEIGHTS BETWEEN DECKS.—In figuring the capacity of spaces where there occur several thicknesses of deck covering, the height shall be taken from the underside of the deck above to the average thickness of such deck planks or plates and coverings thereon as may be: *Provided*, The deck lines of the bounding decks are parallel or crowned to the same camber; otherwise the correction for difference in camber shall be made.

20. BETWEEN-DECK SPACES WITH BREAKS IN SIDES.—When figuring a space where gun sponsons, reentrant ports, or other breaks in the topside occur, the ordinates shall be taken to a line formed by a continuation of the inside line of the frames or the ceiling thereon; the volumes of the breaks shall then be calculated and added to or subtracted from the figure thus found; the result shall be considered the volume of such space.

21. SHELTER DECKS AND UPPER DECKS—DIFFERENCE BETWEEN.—Whether for the purpose of measurement a deck is to be regarded as an upper deck or as a shelter to an upper deck, is to be determined in each instance, both by the character and structural conditions of the erection and by the purpose to which the between deck is devoted. If the deck is a continuous deck, fastened down and water-

[1] The Suez Canal authorities reserve the right to alter their ruling in this connection, after careful consideration of the various types of bulk oil carriers.

tight, sealing up the cylinder formed between the two decks, and making it a fit place for the stowage of cargo, like a hold, the deck is to be treated as an upper deck, and the space between it and the deck below is to be measured. If, however, the cylinder is open to the shipment of seas, and the space is not reasonably fit for the carrying of dry cargo, but is used only for cargo generally classed as "deck loads," such as cattle, horses, chemicals, oil in barrels, etc., then, usually, the deck is to be regarded as a shelter deck, and the space as "sheltered space above the upper deck, which is under cover and open to the weather—that is, not inclosed"—and is not to be included in the recorded tonnage.

22. DEFINITION OF CLOSED-IN SPACES.—By "closed-in spaces" is to be understood spaces which are inclosed and protected from the action of the weather, even though large openings be left in the inclosure, and care will be taken that the intent of the law in this respect is not evaded.

23. PERMANENT ERECTIONS.—Poops, bridge houses, pilot houses, steering screens, or other permanent erections, entirely or partially open at sides or ends or with one or more openings in the sides, ends or in the covering deck, and not fitted with doors, hatches, or other means of closing them, or which may not be easily closed in, shall not be included in the gross tonnage, except when the spaces therein are available or actually fitted or used for cargo, stores, passengers, or crew, when they must be measured and form a part of the gross tonnage of the ship. This section must not be confounded with that portion of the rules referring to shelter or awning decks or to deck loads.

24. OPEN-DECK SPACES FOR BERTHING.—Spaces under shelter decks, such as those under bridges, etc., which are not inclosed or readily inclosed, but are fitted with hammock hooks for berthing accommodations, shall not form a portion of the gross tonnage.

25. DECK ERECTIONS—DIMENSIONS TO FRAMING.—In all cases the interior dimensions of deck spaces and erections shall be taken to the ceiling where such exists, but in the absence thereof, to the interior edge of the frames or supports for the walls of these spaces. Stiffeners on bulkheads shall be considered as supports, even though not connected to the beam above or deck below.

26. DECK ERECTIONS OF IRREGULAR FORM.—When deck spaces have irregular form, such that the general formula, indicated for the measuring of deck spaces, can not be applied to give correct results, the spaces should be subdivided into smaller portions, and each of these measured by the most convenient geometrical formula adapted thereto.

27. HAMMOCK HOUSES AND BERTHING.—All closed hammock houses and closed or readily closed hammock berthing forming erections above decks shall be figured in the gross tonnage.

28. MISCELLANEOUS SPACES.—Ammunition hoists above decks, turrets, and barbettes, conning and signal towers, inclosures of windlass, steering gear, and other spaces for working the ship, and all other such miscellaneous spaces, if within the regulations pertaining to permanent erections, shall form a part of the gross tonnage of a ship, but masts, vents, and cowls, open hammock berthings, etc., are not to form a part of such gross figure.

29. COMPANION HATCHES, SKYLIGHTS, AND ACCESS TRUNKS, ABOVE DECKS.—Companion hatches, skylights, and access trunks, above decks, are not to be considered under the head of hatches, but are to be ignored in the gross tonnage of a ship, except when used as striking-down hatches and directly connected with or trunked down to spaces where stores or cargo are stowed. When a companion house is used as a smoking room, for instance, for the accommodation of passengers it is to be included in the gross tonnage under the head of deck houses.

30. HATCHES FOR COAL PASSING.—In considering the volume of hatches (in excess of one-half per cent gross) the coal hatches or skylights, for striking down bunker coal, are not to be included. All such hatches shall be omitted from the gross figure, except in cases where they are trunked down to the bunkers, when they will be included in the gross and will form a part of the machinery deduction.

31. LIGHT AND AIR SPACES FOR MACHINERY.—The closed or readily closed spaces for light and air or hot-air escape from machinery spaces, on or above the upper deck, shall be considered a part of and figured in the gross tonnage on approval of the request to the Commissioner of Navigation, but such spaces are in no case to be classed under hatches unless used for striking down stores or cargo.

NET TONNAGE.

In procuring the net tonnage of any United States naval ship, for Suez Canal tolls, the deductions as permitted by the canal authorities and appearing in the "Regulations for the Navigation of the Suez Maritime Canal" (ed. Jan., 1914), of which the articles below are extracts, shall be followed.

DEDUCTIONS TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE.

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net registered tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to:

SAILING VESSELS.

(1) ART. 12. For sailing vessels deduct: The spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

(2) Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

(3) The company allows the following spaces to be included in the deductions specified in article 12 of the regulations for the measurement of tonnage, provided the deductions do not, in the aggregate, exceed 5 per cent of the gross tonnage:

(*a*) The chart room, even when also used as a captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(*b*) The cabins of the ship's doctors, if actually occupied by them.

(*c*) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms—one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers.

A mess room, if there is one, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess room in ships having passenger accommodations which are not also provided with a passengers' mess room.

(*d*) All spaces fitted as bathrooms, or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(*e*) All spaces specially provided for the storage of electric searchlights and wireless telegraphy appliances, on condition that they are situated on the upper deck.

(4) The above-specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

(5) Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

(6) ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS.

(1) ART. 14. For vessels propelled by steam or any other mechanical power deduct:

(*a*) The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage.

(*b*) The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine rooms, and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

(2) ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

(3) Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

(a) Ships having coal bunkers with movable partitions.

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms and add to it for screw steamers 75 per cent and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room, together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner:

Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers.

Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown.

Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof.

Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

(b) Ships with fixed coal bunkers.

ART. 17. In ships with fixed coal bunkers measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or 2.83, if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz:

(*a*) The spaces framed in around the funnels.

(*b*) The spaces required for the admission of light and air into the engine rooms.

(*c*) The spaces, if there are any, necessary for the proper working of the engines.

(4) ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions as set forth in article 16 may be applied.

(5) ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage; all spaces occupied by machinery, boilers, and coal bunkers may be deducted.

Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

(6) The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

INSTRUCTIONS AND DEFINITIONS AS TO NET TONNAGE.

1. DEDUCTIBLE SPACE.—No space will be deducted from the gross tonnage, in ascertaining the net tonnage, unless it has been first included in the gross figure.

2. GENERAL DEDUCTIONS FOR QUARTERS.—All spaces for the exclusive use of the persons duly inscribed on the ship's list, with the exception of those for the commanding officer, are deductible within the reserve of the maximum allowance of 5 per cent of the gross tonnage for the total of deductions other than for propelling machinery.

3. INTERPRETATION OF RULES RELATIVE TO PASSENGERS, ETC.—Inasmuch as ships of the Navy are not engaged in commercial pursuits or fitted up for the transportation of persons unidentified with the ship's company, for pecuniary gain, the fact that a passenger or passengers are forced to use spaces intended for use of and assigned to officers shall not prevent the inclusion of such spaces in the deductions, but in general no deductions are to be made for spaces assigned to the accommodation of passengers.

4. DEFINITION OF PASSENGERS.—The admiral, his chief of staff, and flag lieutenant shall be considered passengers, as shall also officers, enlisted men, or other persons who may be aboard of but not assigned to duty with a transport, hospital ship, etc., i. e., all persons not duly inscribed on the ship's list are passengers.

5. CARGO OR STORES IN QUARTERS.—Every space occupied by officers or crew as living spaces or appropriated for their use and deducted therefor shall be kept free from stores and merchandise of

any kind, not being the personal property of those occupying such spaces, and no passengers shall be accommodated therein.

6. DEFINITION OF CARGO.—On ships of war the term "cargo" shall include armament, ammunition, and military and naval equipment; on transports, food, stores, luggage, accouterments, and equipment for passengers; on hospital ships, food stores for passengers, medical stores, and hospital equipment; on colliers, cargo coal and coaling gear; on repair ships, tools, parts for repairs and repair equipment; on ammunition ships, arms, ammunition, etc.; supply and refrigerator ships, cargo stores, etc.; tank steamers, cargo fuel oil; and on distilling ships, distilling machinery and distilled water.

7. CREW'S BERTHING SPACES.—The deductions for crew's spaces are governed by the following principles: When the greater part of a closed-in space is occupied by the mess tables, hammocks, and men's quarters, its entire area, after omitting ventilating shafts, if any, cabins, companion ways, etc., is to be deducted from the gross tonnage: *Provided*, That such parts of the space as are not occupied by mess tables, hammocks, etc., are not of such dimensions as to be available for other purposes. In the case of larger spaces, serving other purposes than as living quarters for the crew—e. g., for gun and torpedo armaments and in which hammocks and mess gear are distributed over the whole space—only that part is to be considered crew's space which is occupied by mess gear, hammocks, and crew's gear, inclusive of the space required for the use of the tables and benches. In general, only such portions of crew's spaces as are actually occupied and used by crew shall form the crew's deduction.

8. CREW'S SPACES NOT FITTED FOR BERTHING.—When spaces are occupied by lockers, mess tables, or other gear for the crew but are not fitted for berthing, they shall form a part of the crew's deduction, provided they are used for no other purpose than the crew's accommodation.

9. CREW'S SPACES ON OPEN DECKS.—When crew's hammocks are swung on open or under shelter decks, as, for instance, under bridges, etc., open at sides or ends, no deductions shall be made unless the spaces in which such accommodations exist have been previously included in the gross figure.

10. HAMMOCK HOUSES AND HAMMOCK BERTHING FOR CREW.—Hammock houses and hammock berthing which is closed or readily closed shall form a part of the crew's berthing deduction, provided, however, such spaces shall have first been included in the gross tonnage.

11. STEWARDS, COOKS, AND MESSMEN.—Passengers, stewards, cooks, and messmen are not considered part of the crew on passenger steamers. On troop ships, transports, or other naval auxiliaries stewards, etc., who are regularly listed on the ship's complement, may be deducted for, even though at times used in the service of passengers, but in cases where such service of passengers is performed by servants shipped for the purpose no deduction shall be made.

On warships (which invariably carry no passengers except official representatives of the Government) the messmen, etc., shall be considered as forming a part of the crew, and their spaces shall be deducted for.

12. CAPTAIN'S QUARTERS.—The captain's quarters, when below decks, are not to be deducted for, and when above decks only such

portion thereof as is used as a chart room is to form a deduction even though permitted as a deduction in the register tonnages of some nations.

13. PASSAGES AND OFFICER'S COUNTRY.—Where open spaces, known as country or passage, are fitted with hammock hooks, lockers, etc., for the use of officers or crew they shall be deductible as berthing spaces, but otherwise such spaces shall form no part of the deduction, except when forming passages exclusively for access to deductible spaces.

14. GALLEYS, BAKERIES, SCULLERIES, AND PANTRIES.—Under the heading of "Cookhouse deduction" the galleys, bakeries, sculleries, and pantries, except spaces especially assigned to the commanding officer or fleet officers, may be included, provided they are used in the preparation of food for persons duly inscribed on the ship's list. Galleys, etc., for the accommodation of passengers will not be deducted.

15. BATHROOMS, LAVATORIES, ETC.—All latrines, lavatories, bathrooms, showers, urinals, and water-closets shall be deducted for, except those provided for the use of the captain or fleet officers and those assigned to passengers.

16. MESS ROOMS.—All mess rooms provided for persons duly inscribed on the ship's list, except the captain or fleet officers, shall form deductible space, but no passengers' mess rooms shall be deducted.

17. SICK BAY, DISPENSARY, AND SICK-BAY BATH.—Any spaces provided for the medical attention of the officers and crew of a ship are to form a part of the deductions thereon, but in the case of a hospital ship having spaces fitted for the transportation or treatment of others than those duly listed on the ship's complement, no such deductions shall be made therefor.

18. DOCTOR AND MEDICAL ATTENDANTS.—The accommodation for the doctors, apothecary, and sick attendants shall form a part of the deductions, even in cases of hospital ships, when they are duly inscribed on the ship's list.

19. SPACES FOR WORKING SHIP.—The windlass house, steering-gear space, conning towers, lookout houses, pilot houses, capstan spaces, signal spaces, wireless rooms, etc., shall be deducted when located above the deck covering the highest between deck, or when, perhaps, under a simple shelter deck; but when below decks such spaces are not to be deducted.

20. DONKEY BOILER AND ENGINE.—The donkey boiler and engine, when in an inclosed space above decks and when connected up with any or all of the auxiliaries—for instance, pumps, steering gear, anchor gear, windlass, capstan, etc.—is to be deducted; but when also used for the purpose of hoisting cargo, as in some merchant ships, it does not form deductible space, except in the case of men-of-war or troop ships, which do not carry cargo for commercial purposes.

21. STEERING-ENGINE SPACES AND WINDLASS-ENGINE SPACES.—The spaces for the steering and windlass engines, etc., are to form a part of the miscellaneous deductions for working the ship, provided they are situated above the uppermost deck; and if located in open space and not bulkheaded off a maximum space of 3 feet on each side for access and attendance will be permitted.

22. SIGNAL SPACES AND LAMP ROOM.—Signal towers or inclosed signal stations above decks may be deducted when used only for signals or signal apparatus connected with the ship, and when the lamp room is above and used for signal lamps only the same may be deducted under this heading.

23. BALLAST TANKS.—Peak tanks and side ballast tanks are in no case to be deducted from the gross tonnage, although such deductions are permitted in the national tonnage of several countries, but in certain cases topside tanks form exempted space.

24. SAIL ROOMS AND BOATSWAIN'S STORES.—Sail rooms and boatswain's stores do not form deductible spaces under these regulations, even though they be deducted for under the national tonnages of the several countries.

25. CLEANING-GEAR SPACES.—The places provided for the stowage of deck gear and other articles used in cleaning the ship are not to form a part of the deductions under these rules.

26. LAUNDRY, ICE MACHINE, AND REFRIGERATOR SPACES.—Laundries, ice machines, and refrigerator spaces are not to form a part of the deductions under these rules, even though provided only for the officers and crew.

27. OFFICES AND STOREROOMS.—Offices provided on a ship for the transaction of routine business, except, perhaps, the doctor's office, are not to be deducted for, and no storerooms are to form a deduction, except, possibly, the navigator's and signal storerooms, and then only when above decks.

28. PRISONS AND BAND ROOMS.—Prisons and band rooms do not usually form deductible space. When the band room is fitted up for the berthing, messing, or living quarters of the band, a deduction may be made for such portions thereof as are so used.

29. PROPELLING-POWER DEDUCTION.—In ascertaining the amount of deduction for propelling power, whichever of the rules [1] (*a*) or (*b*) produces the greater deduction for propelling power shall be used.

(*a*) The actual engine, boiler, shaft alley, and light and air spaces as measured, plus 75 per cent of these spaces for screw steamers and plus 50 per cent for paddle steamers; or,

(*b*) The actual measurement of the above spaces, plus the actual measurement of the permanent bunkers, which can not be extended or increased in size.

30. MOTIVE POWER OTHER THAN STEAM.—In ships provided with motive power other than steam the machinery spaces shall be measured and deducted under Article 14 of the Suez Rules.

31. GOODS OR STORES IN MACHINERY SPACES.—No goods or stores shall be carried in any spaces measured and deducted for propelling power; but spare parts, tools, oil, waste, and the like may be carried in machinery spaces, provided they are not within bulkheaded spaces, separated off from the machinery space proper.

32. CABINS OR STOREROOMS IN MACHINERY SPACES.—When cabins, engineers' storerooms, etc., are located in machinery spaces, they shall not form a part of the propelling-power deductions, but shall be omitted therefrom.

[1] The Danube rule.

33. ENGINEERS' WORKSHOP, DYNAMOS, AND DISTILLERS.—The engineers' workshop, dynamos, and distillers are not to form a part of the propelling-power deductions in a steamship, unless located directly in a machinery space and not bulkheaded off therefrom; but when a distiller is used only for the preparation of potable water for the crew and not used for making steaming water the space therefor may be deducted under the 5 per cent reserve clause for miscellaneous spaces.

34. CRANK PITS AND POCKETS.—All crank pits, pockets, etc., for main and auxiliary machinery in the engine and boiler rooms shall form a part of the propelling-power deductions.

35. AUXILIARY MACHINERY IN PROPELLING-POWER SPACES.—When auxiliary machinery is located in the propelling-power spaces it shall be included in the deduction for the propelling power, but shall not be entitled to a separate deduction under any other head.

36. DONKEY BOILER IN PROPELLING SPACE.—If the donkey engine and boiler are within the boundary of the machinery space, and are used in connection with the main machinery, they are to be included in the propelling-power deduction, and the space occupied by them shall not be entitled to a separate deduction in addition.

37. MACHINERY OR FITTINGS IN FIDLEYS.—Whenever machinery or fittings are located in the engine or boiler room uptake casings, and no bulkhead incloses them except the casings bulkhead, the whole or entire volume of these uptake spaces shall form a portion of the deduction for propelling power, but when the auxiliary machinery is bulkheaded off from the rest of the space, such portions as may have been inclosed for such machinery or fittings shall not form a portion of the propelling-power deduction.

38. ENGINE AND FIREROOM BLOWER.—When blowers for machinery spaces are located in, or are in a compartment adjacent to, the machinery spaces they shall form a part of the machinery deduction of the ship; in general, all spaces for the ventilation of machinery compartments situated below the upper deck are considered as forming a part of the propelling-power deduction.

39. AIR CASINGS.—When machinery spaces are fitted with air casings, the air spaces are to be included in the propelling-power deductions, as they form part of the ventilation of such spaces.

40. LIGHT AND AIR CASINGS NOT EXTENDING TO TOP OF INCLOSED SPACE.—Whenever, in the case of an otherwise inclosed superstructure, large but readily closed openings surrounding the funnels are provided in the cover deck and the entire volume of such space is figured in the gross tonnage, only such portions of the light and air casings from the boiler and engine rooms as may actually extend into such spaces shall be figured in the propelling-power deductions.

41. LIGHT AND AIR SPACES ABOVE DECKS.—All portions of light and air spaces to propelling machinery up to the gratings or plates covering them are to be included in the machinery deduction, even such portions as extend above the deck inclosure, provided they have been included in the gross tonnage.

42. MOVABLE BUNKERS.—When the "Danube rule" is not used, but actual bunker space as well as actual machinery is measured and deducted, the bunkers are to be measured separately and added

together, but none are to be included in such deductions which can in any way be extended or increased in volume by the means of movable partitions or bulkheads. On colliers, no part of the space assigned to cargo is to form a part of the deduction for bunker coal.

43. METHODS OF TAKING MEASUREMENTS IN BUNKERS.—When using actual volume of bunkers for fuel deductions, the measurements are to be taken to the underside of deck and inside of frames and not to underside of beams and outside of frames as are required in standard bunker capacities.

44. COAL TRUNKS.—All fixed coal trunks shall be considered as having been included in the 75 per cent space deduction for fuel when using the "Danube rule," but when the actual capacity of the fuel spaces is used the coal trunks and chutes are to be figured and added thereto as forming a part of the fuel space.

45. FUEL-OIL TANKS.—When part of the double bottom is fitted up for the carrying of oil fuel for the ship's fires in an ordinary coal-burning vessel, no deduction shall be made for such space, since it is exempted space not measured for gross tonnage, but in cases of oil-burning ships the fuel tanks thereof, except double-bottom tanks, shall be considered as fuel compartments and figured in the propelling power deduction similarly to coal bunkers.

46. SHAFT TUNNELS WITH A RAISED FLAT UNDER.—The deductions for shaft alleys in cases where a shaft alley flat is fitted above the inner or outer bottom plating should not include the space below such flat, but should be measured only to the floor plates thereof, provided such plates, although nonwater-tight, form a complete floor for the compartment. In other cases figure to the bottom of the compartment as if the incomplete flat were not fitted.

47. SHAFT TUNNELS NOT CLEARLY DEFINED.—When shaft tunnels are not clearly defined by bulkheads and the ship is more or less open, only such portions as are necessary about the shaft and thrust block shall constitute a deduction. The thrust-block space should be taken of such length and breadth as to admit of a man's getting around it to remove the holding-down bolts, and the height shall not exceed 7 feet except when more space is absolutely necessary. The shaft space need not exceed 6 feet head room and 3 feet passage on one side with clearance on the other side. When the ship is open from side to side and the space abaft the engine room through which the shafts pass is used for cargo stores, etc., no deduction shall be made.

METHOD OF PROCEDURE.

In figuring the Suez tonnage of any vessel the mode of procedure, after the necessary finished plans, lines, and mold loft dimensions are in hand, shall be as follows:

1. Ascertain what spaces are exempt from measurement, if there are any, and what deck constitutes the tonnage deck.

2. Make sketch of stem and stern contours and obtain the below and between deck lengths.

3. Lay out below and between deck sections at the proper stations and figure offsets and heights thereon as may be necessary for obtaining areas.

4. Calculate the below-deck volume, omitting exempted spaces, and including necessary appendages.
5. Figure volume of between-deck spaces from areas found.
6. Figure deck erections coming within the requirements from detail sketches if necessary.
7. Obtain volume of hatches in excess of one-half of 1 per cent of above spaces.
8. From above volumes obtain the "gross Suez Canal tonnage."
9. Determine volume of the spaces assigned to crew's and officers' berthing and also such other miscellaneous spaces as may be properly deductible up to 5 per cent of the gross figure and deduct the same.
10. Lay out such sketches as may be necessary and calculate the volume of the machinery spaces.
11. Determine from the types and capacities of the several bunkers whether the "Danube rule" or actual bunker capacity is to be used in the propelling power deduction.
12. Obtain the propelling-power deduction up to a maximum figure of 50 per cent of the gross tonnage.
13. Deduct the propelling-power figure from that found after deducting for berthing, etc., and secure the "Net Suez Canal tonnage."
14. Prepare a certificate in accordance with the above figures, after checking same, and issue such certificate to the ship.
15. Record certificate in tonnage book and file actual calculations.

CLASSIFICATION OF ITEMS ON CERTIFICATE.

1. Gun turrets and barbettes are to appear under the heading "Roundhouses" when entering volumes in the certificate.
2. Closed hammock berthing (when above decks) shall be included under the heading "Side houses."
3. Light and air spaces to machinery (when extending above decks) shall appear under "Spaces necessary for working the ship."
4. "Berthing accommodations of crew" is to include only berthing and messing spaces therefor.
5. "Berthing accommodations of officers" is to include staterooms, doctor's cabin, and officers' mess rooms, bathrooms, lavatories, water-closets, etc.
6. The miscellaneous deductions are to include galleys, crew's water-closets and wash rooms, sick bays, and such properly deductible spaces as may be necessary for working the ship.
7. The "Engine room as measured" shall include that portion of "light and air spaces for machinery" which extends above decks.

RÉSUMÉ.

The gross tonnage for the Suez Canal shall include:
1. (*a*) Space below the tonnage deck, except exempted space; (*b*) space forward of No. 1 ordinate, in the bow; (*c*) space abaft the last ordinate, in the stern.
2. Space between decks, above tonnage deck.

3. Spaces above uppermost complete deck (if closed in or readily closed), as follows:

1. Poop.
2. Bridge space.
3. Forecastle.
4. Turtlebacks and hoods.
5. Breaks in decks.
6. Turrets.
7. Barbettes.
8. Gun sponsons.
9. Gun housings.
10. Torpedo housings.
11. Ammunition hoists.
12. Range-finding stations.
13. Directing stations.
14. Engineer's workshops.
15. Carpenter shop.
16. Blacksmith shops.
17. Laundries.
18. Drying rooms.
19. Ice-machine spaces.
20. Dynamo rooms.
21. Distiller rooms.
22. Conning towers.
23. Signal towers.
24. Lookout houses.
25. Lamp rooms.
26. Pilot houses.
27. Steering-gear spaces.
28. Steering-engine rooms.
29. Windlass houses.
30. Chain lockers.
31. Winch houses.
32. Capstan houses.
33. Donkey engine and boiler houses.
34. Chart houses.
35. Closed steering screens.
36. Wireless rooms.
37. Searchlight houses.
38. Storerooms.
39. Prisons.
40. Band rooms.
41. Deck-gear spaces.
42. Offices.
43. Staterooms.
44. Mess rooms.
45. Saloons.
46. Smoking rooms.
47. Companion houses.
48. Hammock houses.
49. Hammock berthing.
50. Crew's quarters.
51. Officers' quarters.
52. Captain's quarters.
53. Admiral's quarters.
54. Fleet staff's quarters.
55. Passengers' quarters.
56. Servants' quarters.
57. Sick bay.
58. Dispensary.
59. Medical attendants' quarters.
60. Galleys.
61. Bakeries.
62. Pantries.
63. Sculleries.
64. Water-closets.
65. Urinals.
66. Latrines.
67. Bathrooms.
68. Showers.
69. Lavatories.
70. Wash rooms.
71. Water-tank compartments.
72. Cofferdams.
73. Cargo spaces.
74. Light and air spaces for machinery.
75. Coal bunkers and trunks.
76. Cargo hatches in excess of one-half of 1 per cent gross.

The following spaces are exempted from measurement:

1. The double bottoms, except peak tanks.
2. Side ballast tanks, provisionally.
3. Masts above decks.
4. Vents and cowls above decks.
5. Open steering screens.
6. Companion hatches.
7. Skylights.
8. Tanks on deck, not part of hull structure.
9. Lockers on deck, not part of hull structure.
10. Spaces under open shelter decks.
11. Spaces for "deck loads."
12. Spaces not inclosed or readily inclosed.

The following spaces may be deducted in securing the net tonnage, up to a maximum of 5 per cent of the gross:

(*a*) Only if above deck—

1. Navigator's storeroom.
2. Conning towers.
3. Lookout houses.
4. Signal houses.
5. Pilot houses.
6. Closed steering screens.
7. Windlass houses.
8. Chain lockers.
9. Winch houses.
10. Capstan houses.
11. Donkey boiler and engine space, provisionally.
12. Chart houses.
13. Steering-gear spaces.
14. Steering-engine rooms.
15. Wireless houses.
16. Searchlight spaces.
17. Lamp rooms for signals.

(*b*) Whether situated above or below decks—

1. Crew's berthing and messing and living spaces wherever located.
2. Officers' berthing and messing and living spaces wherever located.
3. Cooks', servants', etc., quarters, provisionally.
4. Doctors', medical attendants', and apothecary's quarters.
5. Sick bays, except on hospital ship.
6. Dispensaries, except on hospital ship.
7. Doctors' offices.
8. Galleys, except passengers', captain's, and fleet officers'.
9. Bakeries, except passengers', captain's, and fleet officers'.
10. Pantries, except passengers', captain's, and fleet officers'.
11. Sculleries, except passengers', captain's, and fleet officers'.
12. Mess rooms, except passengers', captain's, and fleet officers'.
13. Water-closets, except passengers', captain's, and fleet officers'.
14. Urinals, except passengers', captain's, and fleet officers'.
15. Latrines, except passengers', captain's, and fleet officers'.
16. Bathrooms, except passengers', captain's, and fleet officers'.
17. Showers, except passengers', captain's, and fleet officers'.
18. Lavatories, except passengers', captain's, and fleet officers'.
19. Wash rooms, except passengers', captain's, and fleet officers'.
20. Hammock berthing.
21. Hammock houses.
22. Condenser space—crew's drink only.

The following spaces shall not form a part of the deductions from the gross, which are under the restriction of the 5 per cent clause:

1. Turrets.
2. Barbettes.
3. Gun sponsons.
4. Gun and torpedo housings.
5. Ammunition hoists.
6. Range-finding and directing stations.
7. Armories.
8. Workshops.
9. Ice-machine spaces.
10. Dynamo rooms.
11. Distiller spaces, except as above.
12. Laundries.
13. Drying rooms.
14. Cargo-hoist spaces.
15. Open steering screens.
16. Storerooms.
17. Boatswains' stores.
18. Sail rooms.
19. Prisons.
20. Band rooms (unless quarters).
21. Deck gear spaces.
22. Offices.
23. Water-tank compartments.
24. Peak tanks.
25. Topside tanks.
26. Cofferdams.
27. Cargo spaces.
28. Captain's quarters, except chart rooms.
29. Admiral's quarters.
30. Fleet staff's quarters.
31. Passengers' quarters.
32. Passengers' servants' quarters.
33. Passengers' luggage rooms.
34. Passengers' water-closets, lavatories, etc.
35. Passengers' mess rooms and saloons.
36. Smoking rooms.
37. Companion houses.
38. Hospitals and dispensaries on hospital ships.
39. Engineers' machine shops.
40. Refrigerator spaces.
41. Cargo spaces.
42. Passages, except when forming necessary access to deductible spaces.
43. Open country.
44. Double bottoms.
45. Masts.
46. Vents and cowls.
47. Companion hatches.
48. Skylights.
49. Open spaces for deck loads.
50. Spaces under shelter decks.

The following spaces shall be included in the propelling power deduction, the total of which shall not exceed 50 per cent of the gross tonnage.

1. Engine room.
2. Crank pits.
3. Pump pockets in machinery spaces.
4. Air locks.
5. Vent spaces and trunks for machinery spaces.
6. Boiler rooms.
7. Blower rooms for forced draft.
8. Shaft alleys.
9. Thrust block pockets.
10. Donkey boiler and engine spaces, provisionally.
11. Fidleys.
12. Light and air spaces above decks.
13. Air casings, for insulation, if within machinery spaces.
14. Auxiliary machinery spaces in main machinery compartments.
15. Coal spaces.
    (*a*) Actual capacity of bunkers and trunks thereto.
    (*b*) Seventy-five per cent machinery space for screw steamers or 50 per cent for paddle steamers.
16. Fuel oil, in other than double bottom compartments, which are exempt from measurement in gross.

The following spaces are not to form part of machinery deduction when bulkheaded off from machinery space proper or forming a separate space therefrom:

1. Dynamo rooms.
2. Distiller spaces.
3. Engineers' workshop.
4. Storerooms in machinery spaces.
5. Donkey engine and boiler when not in or immediately adjacent to machinery spaces.
6. Staterooms in machinery spaces.

REFERENCES.

For reference in connection with the question of tonnage, see—

(*a*) United States Statutes at Large, Revised Statutes United States, Nos. 4150 to 4154, pages 803 to 806.
(*b*) Supplement, Revised Statutes United States, volume 1, act of August 5, 1882, page 378, chapter 398, act of June 19, 1886, page 494, chapter 421, section 5.
(*c*) Supplement, Revised Statutes United States, volume 2, act of March 2, 1895, page 407, chapter 173.
(*d*) United States Statutes at Large, volume 35, part 1, Public Laws, act of February 6, 1909, page 613, chapter 82, section 1.
(*e*) Customs Regulations, 1908. (Treasury Department.)
(*f*) Navigation Laws, United States, 1911 (corrected). (Department of Commerce and Labor).
(*g*) Instructions relating to the measurement of ships, 1913. (British Board of Trade.)
(*h*) Regulations for the Navigation of the Suez Maritime Canal, 1914.
(*i*) Translation (Naval Intelligence). Instructions for the measurement of ships. (German.)
(*j*) Responses aux Questions de Tonnage concernant les Navires de Guerre. (C. & R. No. 6215A21 to 25.)
(*k*) Letter, Bureau of Navigation, Department of Commerce and Labor. (C. & R. No. 6563A7 and 8.)
(*l*) Letter No. 6215A19 and 20 in re rulings of the Suez Co.
(*m*) Report on certificate, U. S. S. *New York* (6215A8).
(*n*) Copy of Suez certificate for the U. S. S. *Abarenda* (25945E3).

INDEX TO PART V.—SUEZ NAVAL MEASUREMENT.

	Page.
Access trunks	98
Accommodations for passengers	98-100
Accuracy of measurements	89
Air casings in machinery spaces	104
Alteration of certificates	88
Ammunition hoists	97
Apothecary, accommodation	102
Areas of sections	90
Auxiliary machinery, in propelling power spaces	104
Awning decks	89, 97
Bakery	102
Ballast tanks	96, 103
Band rooms	103
Barbettes	97, 106
Bathrooms	99, 102
Bathrooms, passengers'	99
Battens, spaced apart	95
Beam, spring of	95
Berthing, hammock, closed	97
Berthing, open hammock	97
Berthing spaces, definition of crew's	101
Berthing spaces open	97, 101
Between-deck heights	91, 96
Between-deck lengths	91, 96
Between-deck tonnage	91
Blowers in machinery spaces	104
Boatswain's stores	103
Boiler rooms	99
Breadths, half	90, 95
Breadths on sections, lowest	95
Break decks, method of measuring	94
Break, definition of	94
Breaks	92
Breaks in inner bottom	94
Breaks in topside	96
Breaks, laden ships	93
Bunkers:	
Method of measuring	105
Movable	99, 104
Permanent	100, 103, 105
Cabin, captains'	98
Calculations, preservation of	87, 106
Capstan spaces	102
Captains' quarters	98, 101
Cargo, definition of	101
Ceiling	90, 95, 97
Ceiling, absence of	95
Cellulose	96
Cement, in tonnage spaces	96
Certificates:	
Alteration of	88
Preparation of	87, 106
Record of	87, 106
Certificates to contain details of measurement	87
Certification of spaces	88
Changes, remeasurement due to	88
Chart house	98
Classification for divisions of length	90
Cleaning gear spaces	103
Closed-in spaces	92, 99, 106
Closed-in spaces, definition of	89, 97
Closed-in spaces for working ships	98, 100
Closed-in spaces, laden ships	93
Closed-in spaces, openings in	89, 97
Coal bunkers	99, 100

	Page.
Coal bunkers, choice of rule for	100
Coal bunkers, deductions for	99
Coal bunkers, fixed	99
Coal bunkers, movable	99
Coal trunks	105
Cofferdams	96
Companion hatches	98
Companion houses	98
Complete decks	94
Conning towers	97, 102
Cook houses, galleys	98, 102
Cooks, passengers'	101
Country, officers'	102
Cowls	97
Crank pits	104
Crew's spaces	98, 101
Crew's spaces on open decks	101
Crew's spaces, other than berthing	101
Cubic meters to tons, ratio of	89
Danube rule	103
Deck, definition of tonnage	89
Deck erections	97
Deck-gear spaces	103
Deck houses	92
Deck houses, laden ships	93
Deck loads	89, 97
Decks, awning	89
Decks, shelter	89, 96
Deductible spaces	100, 107
Deductible spaces, requirements for	100
Deduction, definition of machinery	99
Deduction, limit of coal bunker	99, 103
Deduction, measurement of machinery	99, 100
Deduction not to exceed 5 per cent	98, 107
Deductions for quarters	100
Deductions, general and special	98
Deductions, limit of machinery	99, 108
Deductions, machinery	99, 108
Deductions, miscellaneous	98, 99, 106
Deductions, propelling	99, 103, 108
Deductions, spaces not to be included in	108, 109
Depths, method of taking	90
Dispensary	102
Distiller room	104
Doctor's accommodations	102
Doctor's cabin	98
Doctor's office	103
Donkey boiler	102, 104
Donkey engine	102, 104
Double bottoms	91, 96
Drawings, preservation of	87
Dynamo room	104
Engine rooms	99
Engineer's workshop	104
Erections, dimensions of	97
Erections of irregular form, deck	97
Erections, open, deck	97
Erections, permanent	97
Exempted spaces	89, 93, 94, 107
Exempted spaces, enumeration of	89
Exempted spaces, use of, for profit	94
Extent of spaces, reasonable	88
Factors for laden ships	93
Factors for Rule II	93
Features not covered by rules	87
Feed-water tanks	96
Floors, rise of	95
Forecastle, length of	96
Foreign certificates, remeasurements of ships with	88
Fuel-oil tanks	96, 105
Fulfillment of requirements	88
Galleys	98, 102, 106
General deductions	98, 107
Girting	93
Gross tonnage, definition of	89
Gross tonnage, spaces included under	106
Gun ports	96
Gun sponsons	96
Half breadths	95
Half breadths at side	95
Hammock berthing	97, 101
Hammock berthing, closed	97, 101, 106
Hammock berthing, open	97
Hammock houses	97, 101
Hatches, coal	98
Hatches, companion	98
Hatches, method of measuring	93
Hatches, trunked down	98
Heights below deck	90
Heights between decks	91, 96
Hospital ship, sick bay	102
Ice-machine spaces	108
Inner bottom, breaks in	94
Inner bottom, exemption of	91
Insulation, breadths to	95
Irregular sections	95
Items in certificate, classification of	106
Laden ships, method of measuring	92
Laden ships, use of rules for	87
Lamp rooms	103
Latrines	98, 102
Laundries	103
Lavatories	99, 102
Length between decks	91, 95
Length, classification of vessels for	90
Length for tonnage sections, divisions of	90
Length, measurement of	90
Light and air casing above decks	104, 106
Light and air casing between decks	99, 104
Light and air spaces to machinery	93, 98, 100
Limit of deduction, 5 per cent	98, 107
Lookout houses	102
Lowest breadths	95
Machinery allowance for tugs	100
Machinery compartments, ventilation of	104
Machinery deduction, definition of	99
Machinery deduction, limit of	99
Machinery deduction, measurement of	99, 100
Machinery deductions	108
Machinery in fidelys, auxiliary	104
Machinery in propelling-power spaces, auxiliary	104
Machinery spaces, cabins or storerooms in	103
Machinery spaces, pockets in	104
Machinery spaces, stores in	103
Masts	97
Measurement, uniformity of	87
Measurements, accuracy of	89
Measurements, deviation from method of taking	89
Measurements from plans	88
Measurements, method of taking	90
Measurements of sister ships	88
Measuring laden ships, method of	92
Medical attendants, accommodations for	102
Mess rooms	98, 102
Mess rooms, passengers'	98, 102
Messmen	101
Messmen, passengers'	101
Method of procedure in calculation	105
Method, use of best, adapted	89
Motive power other than steam	103
Movable bunkers	99, 104
Net tonnage	98, 100, 107
New rules	87
Office, doctor's	103
Officers' spaces	98
Offices	103
Oil tanks, fuel	96, 105
Open berthing spaces	97, 101
Open erections	93, 97
Open vessels	92
Openings in "closed-in" spaces	89, 97
Original figures, desirability of retaining	88
Paddle steamers, propelling-power deduction	99, 103
Pantries	102
Partial decks	94
Passages	102
Passengers' accommodations	98, 100
Passengers' bathrooms	99, 102
Passengers, definition of	100
Passengers' mess rooms	98, 102
Peak tanks	96, 103

	Page.
Penalty for use of exempted spaces	94
Permanent bunkers	100, 103, 105
Permanent erections	97
Pilot house	97, 102
Plans, measurements from	88
Pockets in machinery spaces	104
Poop, length of	96
Power, other than steam, motive	103
Preparations of certificate	87, 106
Prisons	103
Procedure, method of	105
Projecting stern	95
Propelling-power deduction	99, 103, 108
Propelling-power deduction, choice of rule for	103
Propelling power, limit of deduction for	99, 108
Quarters, captain's	98, 101
Quarters, cargo in	100
Quarters, deduction for	100
Ram bow, volume of	95
Record of certificates	87, 106
Refrigerator spaces	103
Remeasurement due to changes	88
Remeasurement of ships with foreign certificates	88
Remeasurement under Rule I	87
Requirements for lighting, ventilation, and seaworthiness, fulfillment of	88
Retaining original figures, desirability of	88
Rise of floors, breadths on	95
Roundhouses	106
Rule I	87, 90
Rule I, remeasurement under	87
Rule II	87, 92
Rules, addition of new	87
Rules for laden ships, use of	87, 92
Rules for unladen ships	87, 90
Rules, new	87
Sail rooms	103
Screw steamers, propelling-power deduction	103
Sculleries	102
Searchlight	99
Sections, area of	90
Sections, division of length for	90
Sections of irregular form	95
Shaft alleys	96, 99
Shaft alleys, extent of	105
Shaft alleys, open	105
Shaft alleys, raised flat under	105
Shelter decks	89, 96, 97
Shelter for deck loads	89
Sheltered space	97
Showers	102
Sick bay	102, 106
Side houses	106
Signal spaces	102, 103
Signal towers	97, 99, 103
Sister ships, measurement of	88
Skylights	98
Spaces, certification of	88
Spaces, closed in	92, 99, 106
Spaces exempt from measurement	93, 94, 97
Spaces for working ship	97, 98, 102
Spaces not forming part of deduction	108
Spaces not inclosed	92, 93, 94
Spaces reasonable in extent	88
Spar ceiling	95
Spare parts for machinery	103
Spring of beam	95
Steamers, paddle, propelling-power deduction	103
Steamers, screw, propelling-power deduction	103
Steering-engine space	102
Steering-gear house	97, 98
Steering-gear space	102
Stewards	101
Stewards, passengers'	101
Storerooms	103
Storerooms, navigator's	103
Storerooms, signal	103
Stores, boatswain's	103
Stores in machinery spaces	103
Stuffing-box space, shaft tunnel	96
Tanks, ballast	96, 103
Tanks, feed water	96
Tanks, fuel oil	105
Tanks, peak	96, 103
Tanks, topside	96, 103
Ton of measurement	89
Tonnage between decks	91
Tonnage deck, definition of	89, 94
Tonnage, gross, spaces included under	106
Tonnage, net	98, 100, 107
Tonnage, net, deductible spaces	98, 107
Tonnage, register	98
Tonnage sections, division of length for	90
Tonnage under deck	90, 92
Tons to cubic meters, ratio of	89
Tools for machinery	103
Topside tanks	96, 103
Trunks, access	98
Trunks, coal	105
Tugs, machinery allowance for	100
Turrets	97, 106
Under deck tonnage	90, 92
Under deck tonnage figures, use of old	88
Uniformity of measurement	87
Unladen ships, rule for	87, 90
Upper decks	96
Urinals	102
Use of compartment, designation of	88
Use of exempted spaces for profit	94
Use of figures from previous calculation	88
Use of formula best adapted	89
Ventilation of machinery compartments	104
Vents	97
Water-closets	102, 106
Web frame ships	95
Windlass engine space	102
Windlass house	97, 98, 102
Wireless room	99, 102
Workshop, engineers'	104

OCT 2 . 1919

BOUND

DEC 15 1920

UNIV. OF MICH.
LIBRARY

UNIVERSITY OF MICHIGAN

3 9015 06280 8731